CITY OF WOOD RIVER, ILLINOIS
RESPONSE TO U.S.E.P.A. ADMINISTRATIVE ORDER
[Docket No.: V-W-05-AO-16]

Wood River
ILLINOIS
Progressing in the spirit of Lewis & Clark

CSO LONG TERM CONTROL PLAN

MAY 2007

JAMES EDWARD McCLEISH
062-049478
REGISTERED
PROFESSIONAL
ENGINEER
OF
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5/11/07
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EXP 11-30-2007

HORNER & SHIFRIN, INC.
ENGINEERS

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TABLE OF CONTENTS

Section	Description	Pages
I	**INTRODUCTION**	
	A. Purpose of Long Term Control Plan (LTCP) Preparation	I- 1
	B. Special Conditions and Considerations	I- 1
	C. Scope of LTCP	I- 3
	D. Data Period Analyzed	I- 4
II	**CHARACTERIZATION ACTIVITIES**	
	A. Sewer System Description / Operation	II- 1
	B. Sewer System Tributary Watershed	II- 1
	C. Characterization of CSO Discharges	II- 4
	D. Characterization of Receiving Stream	II- 6
	E. Data Period Analyzed	II-11
III	**MONITORING / MODELING ACTIVITIES**	
	A. Mississippi River Monitoring Results (Dry Weather)	III- 1
	B. CSO Discharge and Mississippi R. Monitoring Results (CSO Events)	III- 3
	C. Monitoring Data Summary and Conclusions	III- 8
IV	**CONSIDERATION OF SENSITIVE AREAS**	
	A. Definition	IV- 1
	B. Implications	IV- 1
	C. Outstanding Nat'L Resource Water/Endangered Species Analysis	IV- 1
	D. Primary Contact Recreation Analysis	IV- 1
	E. Drinking Water Intake Analysis	IV- 1
	F. Economic and Technical Feasibility of Eliminating Exist'g Outfall	IV- 3
	G. Summary of Sensitive Area Concerns	IV- 4
V	**SCREENING / RANKING / ANALYSIS OF CSO CONTROL ALTERNATIVES**	
	A. Stage 1 – Screening / Ranking of Identified Alternatives (Options)	V- 1
	B. Stage 2 – Preliminary Evaluation of Selected CSO Control Options	V-23
VI	**PUBLIC PARTICIPATION PROCESS**	
	A. Existing Public Notification / Participation Approach	VI- 1
	B. Public Participation in CSO LTCP Development Process	VI- 2
	C. Summary and Conclusions From Public Participation	VI- 4
VII	**NINE MINIMUM CONTROLS IMPLEMENTATION STATUS**	
	A. Approved Combined Sewer System Operational Plan	VII- 1
	B. Use of Collection System for Storage	VII- 1
	C. Flow Capture for Treatment Maximization Plan	VII- 1
	D. Pretreatment	VII- 2
	E. Control of Solid and Floatable Materials in CSO's	VII- 2

CITY OF WOOD RIVER, ILLINOIS
CSO LONG TERM CONTROL PLAN
TABLE OF CONTENTS
(Continued)

Section	Description	Pages
VII	**NINE MINIMUM CONTROLS IMPLEMENTATION STATUS** (continued)	
	F. Pollution Prevention Plan	VII- 2
	G. Public Notification Plan	VII- 2
	H. Sewer System Optimization Plan	VII- 3
	I. Sewer Use Ordinance	VII- 3
	J. Recommended Future Action	VII- 3
VIII	**DETAILED EVALUATION OF SELECTED CONTROL ALTERNATIVES**	
	A. Option I.A. – Sewer Separation: Madison Ave. Area	VIII- 1
	B. Option I.B. – Sewer Separation: Central & Hawthorne Area	VIII- 2
	C. Option IV.A. with VII.C. – Peak Flow Attenuation In Conjunction With BP Amoco	VIII- 3
	D. Option VII.B. with VII.A. – CSO End-of-Pipe Treatment Using UV Disinfection and Vortex Technology	VIII- 9
	E. Option VIII.A. – Modify Existing WWTP to Increase Capacity	VIII-10
	F. Recommendations	VIII-16
IX	**CITY'S FINANCIAL CAPABILITIES TO IMPLEMENT CSO CONTROLS**	
	A. Step 1: Residential Indicator Determination	IX- 1
	B. Step 2: Permittee's Financial Capability Indicators Determination	IX- 2
	C. Financial Capability Matrix Preparation	IX- 3
	D. Other Financial Considerations	IX- 3
	E. Capital Funding Options	IX- 4
	F. Financial Summary and Conclusions	IX- 7
	G. Data Period Analyzed	IX- 8
X	**POST-IMPLEMENTATION COMPLIANCE MONITORING PROGRAM**	
	A. General Considerations	X- 1
	B. Proposed Compliance Monitoring Program Specifics	X- 2
XI	**PROPOSED SCHEDULE FOR IMPLEMENTING THIS CSO LTCP**	
	A. General Considerations	XI- 1
	B. Proposed Phased Implementation Schedule	XI- 2

CITY OF WOOD RIVER, ILLINOIS
CSO LONG TERM CONTROL PLAN
TABLE OF CONTENTS
(Continued)

Section	Description	Pages
VII	**NINE MINIMUM CONTROLS IMPLEMENTATION STATUS** (continued)	
	F. Pollution Prevention Plan	VII- 2
	G. Public Notification Plan	VII- 2
	H. Sewer System Optimization Plan	VII- 3
	I. Sewer Use Ordinance	VII- 3
	J. Recommended Future Action	VII- 3
VIII	**DETAILED EVALUATION OF SELECTED CONTROL ALTERNATIVES**	
	A. Option I.A. – Sewer Separation: Madison Ave. Area	VIII- 1
	B. Option I.B. – Sewer Separation: Central & Hawthorne Area	VIII- 2
	C. Option IV.A. with VII.C. – Peak Flow Attenuation In Conjunction With BP Amoco	VIII- 3
	D. Option VII.B. with VII.A. – CSO End-of-Pipe Treatment Using UV Disinfection and Vortex Technology	VIII- 5
	E. Option VIII.A. – Modify Existing WWTP to Increase Capacity	VIII- 7
	F. Recommendations	VIII- 9
IX	**CITY'S FINANCIAL CAPABILITIES TO IMPLEMENT CSO CONTROLS**	
	A. Step 1: Residential Indicator Determination	IX- 1
	B. Step 2: Permittee's Financial Capability Indicators Determination	IX- 2
	C. Financial Capability Matrix Preparation	IX- 3
	D. Other Financial Considerations	IX- 3
	E. Capital Funding Options	IX- 4
	F. Financial Summary and Conclusions	IX- 7
	G. Data Period Analyzed	IX- 8
X	**POST-IMPLEMENTATION COMPLIANCE MONITORING PROGRAM**	
	A. General Considerations	X- 1
	B. Proposed Compliance Monitoring Program Specifics	X- 2
XI	**PROPOSED SCHEDULE FOR IMPLEMENTING THIS CSO LTCP**	
	A. General Considerations	XI- 1
	B. Proposed Phased Implementation Schedule	XI- 2

CITY OF WOOD RIVER, ILLINOIS
CSO LONG TERM CONTROL PLAN
TABLE OF CONTENTS
(continued)

List of Tables

Description	On or Following Page No.
Table 1 – Acres Covered by Each Zoning Section and Percentage of Total Area	II-4
Table 2 – % Contribution of Stormwater Runoff to Combined Sewers by Zoning Area	II-5
Table 3 – CSO Occurrences January 2002 thru December 2005	II-7
Table 4 – CSO Average and Maximum BOD and TSS Concentrations (July 2002 thru December 2005)	II-7
Table 5 – CSO Maximum Fecal Coliform Counts (July 2002 thru December 2005)	II-8
Table 6 – CSO BOD Loading (January 2003 thru December 2005)	II-8
Table 7 – CSO TSS Loading (January 2003 thru December 2005)	II-8
Table 8 – Alton Raw Water Intake Fecal Coliform Data	II-10
Table 9 – Choteau Island Raw Water Intake Fecal Coliform Data	II-10
Table 10 – NPDES Permitted Discharges Upstream of the Wood River CSO Outfall	II-11
Table 11 – NPDES Permitted Discharges Downstream of the Wood River CSO Outfall	II-11
Table 12 – Mississippi River Monitoring Results (Dry Weather)	III-2
Table 13 – CSO Discharge and Mississippi River Monitoring Results (CSO Events)	III-4
Table 14 – Choteau Island Raw Water Intake Annual Fecal Coliform Data	IV-2
Table 15 – BP Amoco 2006 Contribution to Wood River WWTP	V-17
Table 16 – Hartford and Roxanna 2006 Contribution to Wood River WWTP	V-21
Table 17 – Wood River CSO Discharge Volume and Frequency, Storage Pond Capacity, and WWTP Capacity Evaluation (Jan. 2002 – March 2007)	VIII-6
Table 18 – BHRC Wet Weather Treatment System Sizing	VIII-13

List of Figures

Description	Following Page No.
Figure 1 – Existing Overall Combined Sewage Treatment / Discharge Schematic	II- 1
Figure 2 – Combined Sewer System Watershed/Service Area Map	II- 2
Figure 3 – Existing Wood River Combined WWTF's Process Flow Diagram	II- 2
Figure 4 – 2006 Wood River Zoning Map	II- 3
Figure 5 – Sewer System Sections, Zoning Information, and Flow Contribution Ratio	II- 3
Figure 6 – NPDES Permitted Discharges and Drinking Water Intakes Near the Wood River CSO	II-10
Figure 7 – March 30th, 2007 CSO Discharge Event Monitoring Results	III- 6
Figure 8 – April 3rd, 2007 CSO Discharge Event Monitoring Results	III- 6
Figure 9 – YTBD, 2007 CSO Discharge Event Monitoring Results	III- 6
Figure 10 – BP Amoco Storage Ponds Location Map	V- 7
Figure 11 – Madison Avenue Area Sewer Separation Project Location	V-24
Figure 12 – Central & Hawthorne Area Sewer Separation Project Location	V-25
Figure 13 – Option IV.A. Sewer / Treatment System Hydraulic Profiles	VIII- 3
Figure 14 – Schematic Diagram of Ballasted High rate Clarification Process	VIII-12
Figure 15 – Proposed Overall Combined Sewage Treatment / Discharge Schematic	VIII-13
Figure 16 – Option VIII.A. Proposed Wet Weather Treatment System	VIII-15
Figure 17 – BP Amoco Wood River, IL Property To Be Offered for Redevelopment	VIII-17

CITY OF WOOD RIVER, ILLINOIS
CSO LONG TERM CONTROL PLAN
TABLE OF CONTENTS
(continued)

Appendices

Appendix A – Administrative Order (Docket No. V-W-05-AO-16)
Appendix B – City of Wood River Sewer Maps
Appendix C – Data and Methodology for the Rational Method for Calculating Stormwater Runoff
Appendix D – City of Wood River NPDES Permit Reporting Data and Additional Data
Appendix E – Data Analysis for CSO Discharge Characterization
Appendix F – Illinois Pollution Control Board WQS for General Use: Subpart B
Appendix G – AWC Alton, IL WTP Raw Water Intake Sampling Data
Appendix H – AWC Granite City, IL WTP Choteau Island Raw Water Intake Sampling Data
Appendix I – Data Analysis of AWC's Alton and Choteau Island Raw Water Intake Fecal Coliform Data
Appendix J – USGS Daily Stream Flow Data at Grafton, Illinois
Appendix K – Analysis of CSO Impacts to the Mississippi River
Appendix L – Final Revised Sampling Plan
Appendix M – Sampling Location Photolog
Appendix N – Mississippi River Monitoring Results (Dry Weather)
Appendix O – CSO Discharge and Mississippi River Monitoring Results (CSO Events)
Appendix P – 1993 SMS Engineering Investigation of the Use of AMOCO Oil Company Lagoons
Appendix Q – Option I.A.: Madison Avenue Area Sewer Separation Analysis
Appendix R – 2002 Horner & Shifrin Study of Central & Hawthorne Area Flooding
Appendix S – Option I.B.: Central & Hawthorne Area Sewer Separation Analysis
Appendix T – Public Meeting Minutes and Other Documentation
Appendix U – Illinois Department of Natural Resources Threatened and Endangered Species Statement
Appendix V – Illinois Pollution Control Board WQS for Public Water Supply Use: Subpart C
Appendix W – Choteau Island Intake Annual Fecal Coliform Data and Analysis
Appendix X – Corrective Action Plan for Improving the City's Combined Sewer System Operation & Maintenance Record-Keeping
Appendix Y – Maximization of Flow to the POTW for Treatment Plan
Appendix Z – Corrective Action Plan for Improving the City's Combined Sewer System Pollution Prevention Plan Record-Keeping
Appendix AA – Public Notification Plan
Appendix BB – Plan for Optimizing Sewer System Storage to Minimize Frequency, Duration, and Volume of CSO Discharges
Appendix CC – Wood River Financial Capability Assessment Data
Appendix DD – Federal CSO Control Policy
Appendix EE – Wood River's Other Responses to USEPA Administrative Order
Appendix FF – Post-Compliance Monitoring: Nine Minimum Controls Evaluation Checklist
Appendix GG – Hydraulic Evaluation of the City's use of BP Amoco's 72" sewer
Appendix HH – BP Amoco Operating plan for Wood River Facility Wastewater and Surge Management System
Appendix II – Construction Cost Breakdown Spreadsheets for Option IV.A. with Option VIII.A.

END OF TABLE OF CONTENTS

CITY OF WOOD RIVER, ILLINOIS
CSO LONG TERM CONTROL PLAN

I. INTRODUCTION

A. Purpose of Long Term Control Plan (LTCP) Preparation

The primary reason for development of a CSO Long Term Control Plan (LTCP) for the City of Wood River, Illinois at this particular time is to fulfill a requirement stated under Item 9. of an Administrative Order issued by USEPA Region V pursuant to Sections 308 and 309(a) of the Clean Water Act (Docket No. V-W-05-AO-16) and received by the City of Wood River on October 6, 2005. A copy of this Administrative Order is included herein as **Appendix A**.

Specifically, Item 9. of the above-referenced Administrative Order **requires** that the City shall prepare and submit to USEPA a CSO Long Term Control Plan with the evaluation of the City's financial capabilities as required by the Federal 1994 CSO Policy.

The primary purpose of the CSO Long Term Control Plan that will ultimately be developed for the City of Wood River is to create a comprehensive, written guide for use by the elected officials, staff, and citizens of the City of Wood River to follow for many years to come, in attempting to significantly reduce the number of CSO discharge events which occur and to substantially minimize the adverse impact that CSO discharge events have on the aquatic environment.

The City's CSO Long Term Control Plan must be developed within the larger context of several other Federal water quality protection initiatives that directly relate to the combined sewer overflow issue; including NPDES Phase II stormwater regulations, management of water quality on a watershed basis rather than local basis, Total Maximum Daily Load (TMDL) regulations to govern wastewater discharges to receiving streams rather than individual point discharge numeric limitations, and others. This means that the CSO LTCP should be sufficiently comprehensive in principle and far-reaching in scope, to conform with these current and future related regulations.

In the end, the CSO LTCP for the City of Wood River will be a plan that documents the City's recognition of the site-specific nature of the City's combined sewer overflow and it's potential impact on the Mississippi River water quality by utilizing water-quality-based control measures which are technically feasible, affordable, flexible enough to adapt to changing regulations or science, consistent with Federal CSO Control Policy and Illinois water quality protection regulations, and capable of being implemented in phases.

B. Special Conditions and Considerations

At the time of the City's receipt of the Administrative Order, the City of Wood River did not have a CSO Long Term Control Plan in place, nor were any efforts to develop long term CSO control strategies for the City of Wood River underway.

The reason for this situation is that IEPA's review of Wood River's combined sewer system in 2002 (conducted during IEPA's process for renewing the NPDES Discharge Permit for Wood River's wastewater treatment plant) found that "Based on available information, it appears that..." the City's lone CSO outfall did "... not have a high reasonable potential to cause or contribute to violations of applicable water quality standards or use impairment". IEPA further concluded that unless "... information causing the IEPA to reverse this conclusion became available, the Permittee..." need not "... develop a plan for abating such use impairment and bringing the flows from its CSO into compliance with Water Quality Standards".

The City of Wood River was not aware of any information that had become available during the period from July 2002 to October 2005 that might cause IEPA to reverse the above conclusion. However, through communications with IEPA Water Quality staff, it has become known that the Mississippi River in this region is considered impaired due to exceedances in the fecal coliform standards. It is now incumbent on the City of Wood River to develop and submit a LTCP for its lone CSO outfall, given that Item 9. of the USEPA Administrative Order specifically requires that the City prepare and submit to USEPA a CSO Long Term Control Plan (LTCP).

Generally, according to published USEPA guidance documents, a CSO LTCP must incorporate the following minimum elements:

- Characterization, Monitoring, and Modeling of the Combined Sewer System (including Development of a Data Management Plan)
- Consideration of Sensitive Areas
- Evaluation of Alternatives
- Cost / Performance Considerations
- Revisions of the CSO Operational Plan
- Maximizing Treatment at the STP
- Development of an Implementation Schedule
- Development of a Post-Construction Compliance Monitoring Program
- Public Participation

In determining the most efficient approach to developing, and defining the logical elements of a CSO Long Term Control Plan for the City of Wood River, the extensive work already accomplished by the City to control the water quality impacts of its CSO, the City's classification as a small system (given the City's current relatively small population of approximately 11,300), the presence of only <u>one</u> CSO outfall, and the question as to whether the receiving water (Mississippi River) is impaired (if at all) due to natural conditions or other pollutant sources, were all taken into consideration.

Most importantly, USEPA CSO control guidance documents state that small municipalities with populations under 75,000 may not need to complete <u>each</u> of the formal steps outlined in Section II. C. of the Federal CSO Control Policy (refer to **<u>Appendix DD</u>**).

However, at a minimum, such cities are still required to develop a CSO Long Term Control Plan that will provide for the attainment of Water Quality Standards, and that does include at least the following major elements:

- Implementation of the Nine Minimum Controls
- Public Participation
- Consideration of Sensitive Areas
- Development of a Post-Construction Compliance Monitoring Program

Since IEPA determined in 2002 (during IEPA's process for renewing the NPDES Discharge Permit for Wood River's wastewater treatment plant) that the City of Wood River's outfall did <u>not</u> discharge to a sensitive area, the City of Wood River believed that consideration of sensitive areas need not be addressed in the City's Long Term Control Plan. However, subsequent indications from USEPA have been that USEPA still believes that the City's Long Term Control Plan development process should re-examine the possibility of impact on sensitive areas.

Taking into consideration all of the requirements of Section II. C. of the Federal CSO Control Policy, Item 9. of the USEPA Administrative Order, and the special circumstances of the City of Wood River, the scope of this CSO LTCP was developed as described below.

C. Scope of LTCP

The scope of this CSO Long Term CSO Control Plan was discussed and mutually agreed upon by the City of Wood River staff (assisted by their consultant – Horner & Shifrin, Inc.) and USEPA officials. This was accomplished through initial response and subsequent revisions to Item 8.B) of the Administrative Order. On the basis of these discussions, the main topics which will be addressed by this Long Term CSO Control Plan are:

- Limited Characterization of the Sewer System, Tributary Watershed, C.S.O. Discharges, and Receiving Stream
- Limited Monitoring of Receiving Stream and CSO Discharges (without modeling)
- Public Participation
- Consideration of Sensitive Areas
- Nine Minimum Controls Implementation Status
- Evaluation (Cost vs. Performance) of CSO Control Alternatives
- Details of Alternatives Chosen for LTCP
- Evaluation of City's Financial Capabilities to Implement CSO Controls
- Post-Implementation Compliance Monitoring Program
- Proposed Schedule for Implementing the Long Term CSO Control Plan (LTCP)

D. Data Period Analyzed

Due to lack of rainfall events of sufficient intensity / duration to produce combined sewer overflow (CSO) discharges from the City of Wood River's sewer system, the effort to complete this CSO Long Term Control Plan (LTCP) had to be extended by several months beyond the originally-anticipated completion date of November 2006. As a result, data / information was originally gathered and analyzed for this LTCP during the first few months of 2006, generally covering the period from January 2002 to December 2005 (where such a span of historical information was available for a given parameter).

The effort to prepare this LTCP was ultimately delayed, by the lack of CSO-producing wet weather events, to the point where data for the entire calendar year 2006 did become available, for many of the parameters evaluated. However, it was determined by City staff and Horner & Shifrin personnel that the possible benefits to be gained from the effort to gather and analyze this additional data for 2006 (in order to "refine" the analysis / conclusions obtained through review of the years 2002 through 2005 data) was <u>far</u> outweighed by the cost involved in completing that effort.

For that reason, even though this LTCP was not completed until mid-2007, no data from year 2006 has been included herein, or analyzed. Moreover, H & S personnel do not believe that further analysis of 2006 data would have revealed any differences from the analysis of the years 2002 though 2005 data which would be significant enough to alter the conclusions reached in this LTCP from the review / analysis of the 2002 through 2005 data.

END OF SECTION I.

II. CHARACTERIZATION ACTIVITIES

A. Sewer System Description / Operation

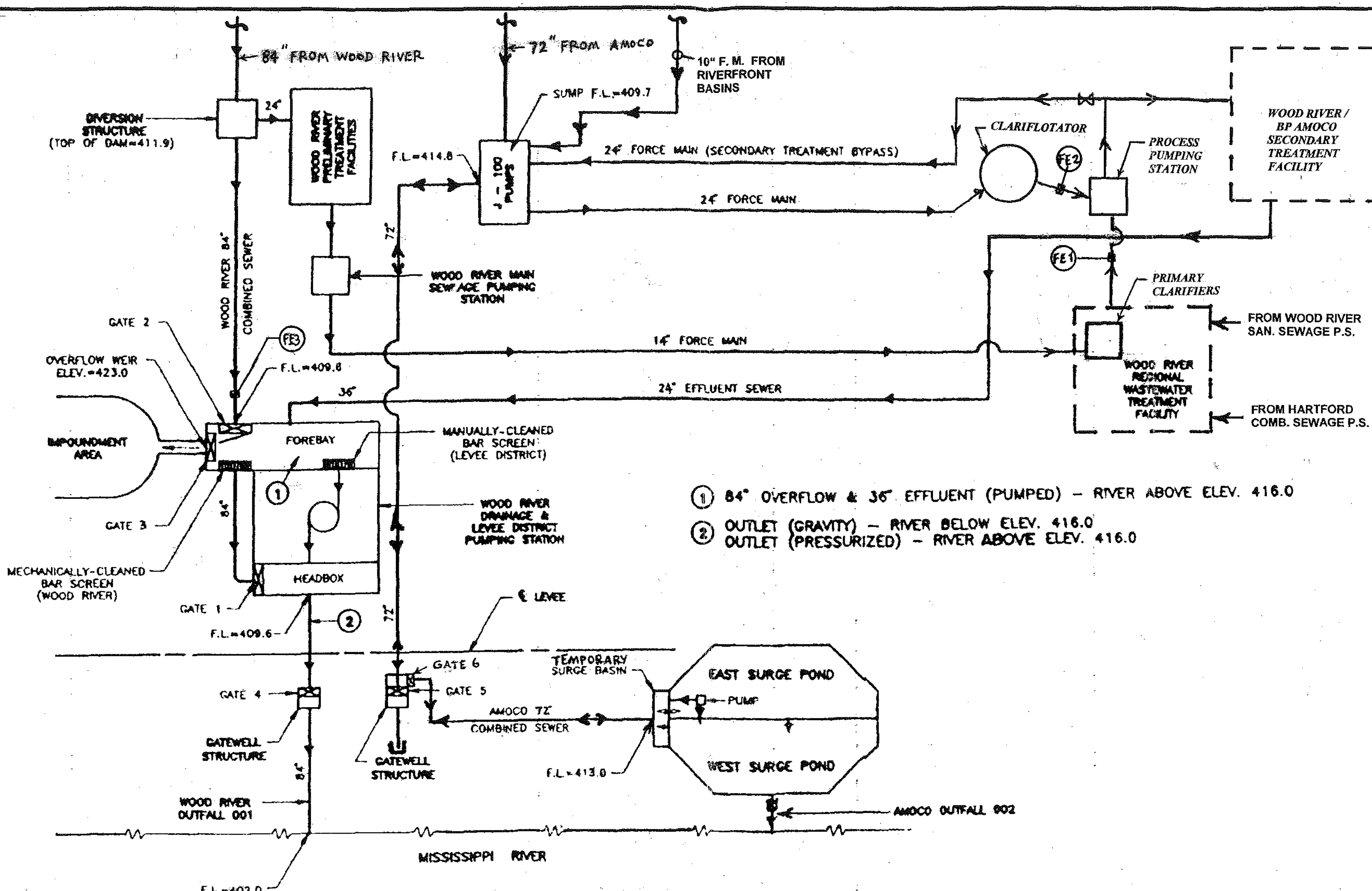
The City of Wood River's sewer system is comprised of approximately 48 miles of combined (storm and sanitary) sewers and 8 miles of strictly sanitary sewers. These sewers receive flows from throughout the City of Wood River, and from the Township subdivision of Kendall Hills. All combined and sanitary sewer flows eventually come together into one 84" combined interceptor sewer which conveys flow in a southeasterly direction, ultimately reaching a diversion dam near the Main Pump Station. This diversion dam directs normal dry weather sewage flow into a 24" pipe leading to the Main Pump Station. From there, the sewage flow is pumped to the City's wastewater treatment plant via a 14" force main. Sewer system maps can be found in **Appendix B** of this LCTP. The configuration of the 84" sewer, Main Pump Station, and other associated piping is illustrated by **Figure 1**, presented on the following page.

The height of the diversion dam is set so that a maximum of 4.8 MGD of sewage flow is directed through the Main Pump Station and on to the wastewater treatment plant. As stated in the City's IEPA-approved Combined Sewer System Operational Plan modified in March 2003, the City of Wood River has established the elevation of this concrete diversion dam, contained within their 84" combined interceptor sewer, at the highest possible elevation to which it can hydraulically be set to "capture" flow for treatment; but yet NOT cause basement flooding during storm events. In addition, the City's Combined Sewer System Operational Plan states that 4.8 MGD is the maximum pumping rate that can be achieved with the Main Pump Station, in the current configuration.

Wastewater volume in excess of 4.8 MGD flows over the diversion dam and continues down the 84" interceptor sewer. Downstream of the diversion dam, a 24" gravity sewer carrying the wastewater treatment plant final effluent is connected back into the 84" interceptor sewer. From that point, the 84" interceptor sewer carries both wastewater treatment plant effluent and combined sewer wet weather overflows (when they occur) to the Wood River Drainage and Levee District Pump Station. The City maintains a manually-operated bar screen at the Wood River Drainage and Levee District Pump Station to provide for removal of debris, solids, and floatables prior to CSO discharge into the Mississippi River through the City's only CSO outfall (Outfall A01). The City's authorization to operate the 84-inch combined sewer in this manner was approved by the Illinois Pollution Control Board on April 6th, 1995 (Opinion and Order of Illinois Pollution Control Board dated April 6, 1995 in the matter of the petition of the City of Wood River for an adjusted standard from treatment of overflows and bypass regulations at 35 ILL. ADM. Code 306.305(a) and (b); PCB 94-16).

B. Sewer System Tributary Watershed

The Wood River Wastewater Treatment Facility not only treats wastewater from the City of Wood River and the Township of Kendall Hills; but also from the Village of Hartford, the Village of South Roxana, and BP Amoco Oil Company. However, CSO discharge events occurring from Wood River's lone 84-inch sewer outfall are comprised of combined sanitary sewage and stormwater flow collected *only* within the City of Wood River and the Township of Kendall Hills.



EXISTING OVERALL COMBINED SEWAGE TREATMENT / DISCHARGE SCHEMATIC

NO SCALE

FIGURE 1

WOOD RIVER, ILLINOIS CSO LTCP

HORNER & SHIFRIN, INC.
5200 Oakland Ave. St. Louis, Missouri 63110
640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

A map of the area, showing those sub-areas served by combined and sanitary sewers, sub-areas which directly contribute to CSO discharge events, as well as other locations of interest are shown in **Figure 2**, on the following page. The population of these areas, based on the year 2000 US Census data, is as follows:

Political Subdivision	Population
City of Wood River	11,296
Township of Kendall Hills	1,050
Village of South Roxana	1,888
Village of Hartford	1,545

The Villages of Hartford and South Roxana convey their wastewater to the Wood River Wastewater Treatment Plant for treatment and subsequent discharge, via a pump station owned and operated by the Village of Hartford. This Hartford Pump Station intermittently pumps an average of 1.2 MGD of combined wastewater to the Wood River Wastewater Treatment Plant through a 10" force main.

Hartford 1.2 MGD

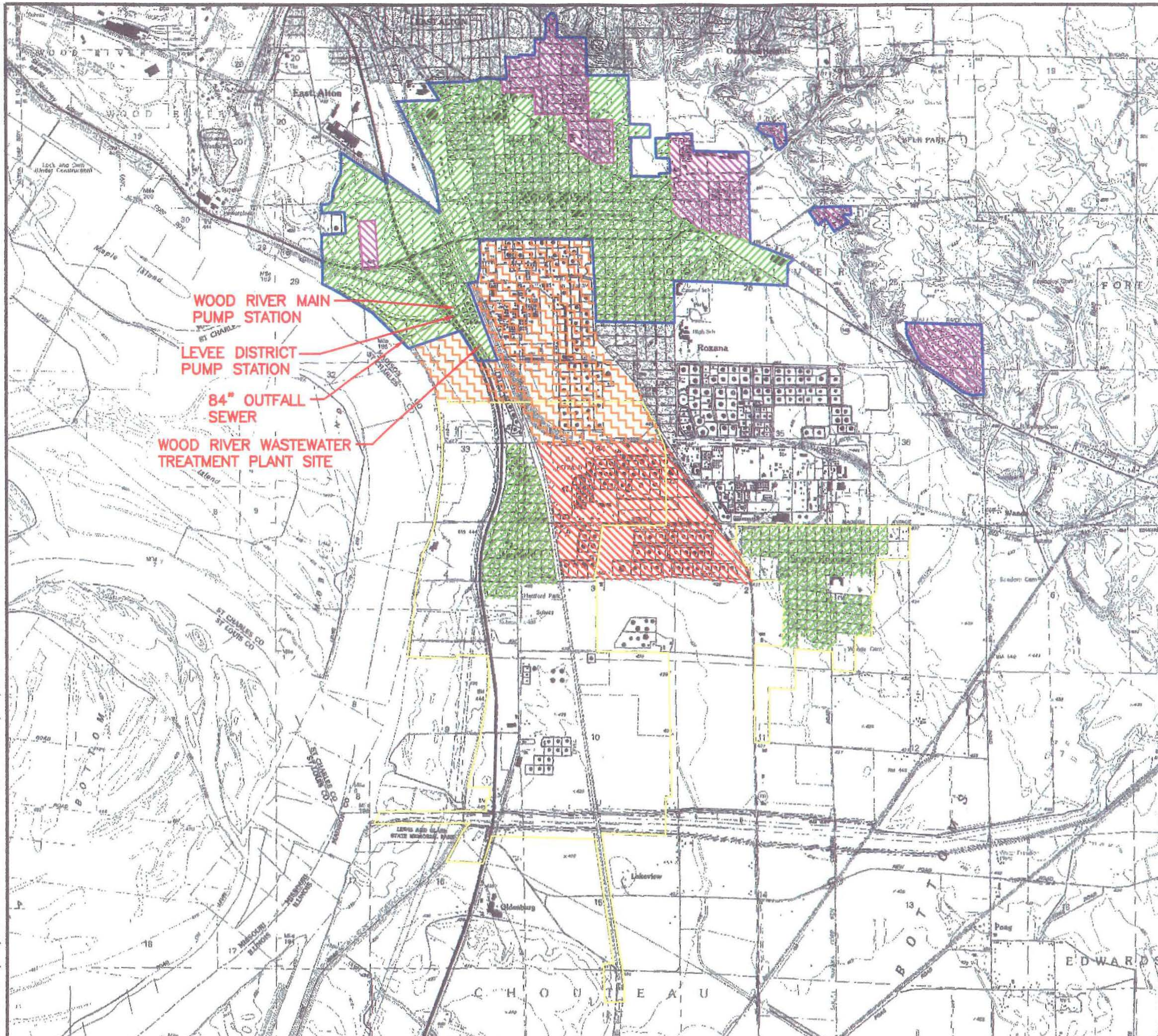
The Wood River Wastewater Treatment Plant operators report that the City's WWTP does experience higher flows from the combined sewers in the jurisdictions serviced by the Hartford Pump Station, as well as from inflow sources in these same areas, during wet weather.

Theoretically, none of this additional flow from Hartford and Roxanna directly contributes to Wood River's CSO discharge events, since it is pumped directly to the Wood River Wastewater Treatment Plant. However, in reality this additional flow to the WWTP could contribute to the volume of Wood River's CSO discharge, because this flow "consumes" treatment capacity of the City's WWTP which could otherwise be used to treat greater volumes of combined wastewater from the combined sewer system of Wood River (and thus avoid the necessity of bypassing treatment before this additional flow is discharged as a CSO).

The BP Amoco Complex in Wood River pumps a continuous flow of 3.6 MGD of wastewater to the Wood River Wastewater Treatment Plant from shallow well remediation of contaminated groundwater, as well as groundwater pumped by BP Amoco in conjunction with a deep well groundwater confinement project to draw down the water table in order to minimize horizontal migration of contaminants in the groundwater off-site. All stormwater runoff from the BP Amoco Complex is collected in BP Amoco's riverfront property storage ponds, and this retained stormwater is eventually returned from these ponds, sent for treatment at the Wood River WWTP.

Amoco 3.6 MGD

All wastewater and stormwater from the BP Amoco site to be treated at the Wood River Wastewater Treatment Plant is treated by a primary treatment train, designated solely for the purpose of treating the flows from BP Amoco, and entirely separate from the treatment train which treats the combined wastewater (domestic plus stormwater) from the City of Wood River's combined sewer system.



LEGEND

AREAS SERVED BY COMBINED SEWER SYSTEMS

AREAS SERVED BY SEPERATE SANITARY AND STORM SEWER SYSTEMS

BP AMOCO PROPERTY – TRIBUTARY TO WOOD RIVER SEWER SYSTEM

CONOCO/PHILLIPS PROPERTY – NOT TRIBUTARY TO WOOD RIVER SEWER SYSTEM

BOUNDARY DELINEATING AREAS IN WHICH FLOW CONTRIBUTES DIRECTLY TO CSO EVENTS

BOUNDARY DELINEATING VILLAGES OF SOUTH ROXANA AND HARTFORD

FIGURE 2

WOOD RIVER, ILLINOIS CSO LTCP

COMBINED SEWER SYSTEM WATERSHED/SERVICE AREA MAP

HORNER & SHIFRIN, INC.
5200 Oakland Ave. St. Louis, Missouri 63110
640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

DWG: N:\05119\Cad\N\05119–FIGURE–2.dwg
PAGE SETUP NAME: ---- CTB: Hs_fullsize.ctb
SAVE DATE: 5/10/2007 2:51:42 PM PLOT DATE: 5/11/2007 8:35:17 AM OPERATOR: BVISINTINE

Domestic Ave 2.5 MGD Peak 6.2 MGD

Amoco Ave 2.6 MGD Peak 3.6 MGD

A flow diagram showing the points where the wastewater from the Hartford Pump Station and BP Amoco enter Wood River's Wastewater Treatment Plant is included herein, as **Figure 3**, presented on following page.

Permitted average and peak flows for the sanitary (domestic) wastewater treatment portion of the facility are 2.5 mgd and 6.2 mgd, respectively while average and peak flows allowable from BP Amoco to the WWTP are 2.6 mgd and 3.6 mgd, respectively.

As stated previously, sanitary and stormwater collected <u>only</u> within the City of Wood River and the Township of Kendall Hills directly contributes to CSO discharge events occurring from Wood River's outfall. The area within Wood River's corporate boundaries consists of a total of approximately 4,168 acres. The basic land uses within this area can be seen in the City of Wood River's 2006 Zoning Map shown on **Figure 4**, presented immediately following **Figure 3**. The percentages of the City that each zoning area covers are presented in **Table 1**, on Page II-5.

Nearly 16% of the City of Wood River is served by separate stormwater and sanitary sewers (not including the BP Amoco site). These areas include parts of the following zoning sections: Multi Family 5, Multi Family 4, Single Family R1, Single Family R2, Community Business, Highway Business, and Business Park. Using the "Rational Method", the percentage of the total stormwater run-off which is prevented from entering the combined sewer system due to separate storm sewers and/or detention basins, and thus prevented from contributing to CSO discharge flows, is 26%.

By dividing up the City's combined sewer system in the same manner as the City of Wood River Sewer Maps are organized (see **<u>Appendix B</u>** of this LTCP), then determining the areas of each zoning category within each Sewer Section, then determining the areas currently served by separate storm sewers, and then applying the "Rational Method", the estimated amount of stormwater run-off entering the combined and separated sewer system in each Sewer Section was determined **using a one-hour three-month rainfall intensity**. The one-hour three-month rainfall intensity for Madison County, Illinois as reported by the Midwest Climate Center is 0.81 in / hr. This recurrence interval of three months was chosen because theoretically an event of this recurrence will occur on average four times a year. Thus, by designing to this level of control, it is assumed that CSO regulations for the demonstrative approach of a target of an average of four or less CSO events per year will be met. The duration of a one hour rainfall event was chosen on the basis of USEPA recommendations presented at a workshop on CSO LTCPs for small communities held in Columbus, Ohio on September 19th, 2006. *

Using the above-described method, the percentage contribution of stormwater runoff entering the combined sewer system for each zoning area was calculated. The results of this calculation are presented in **Table 2**, on Page II-5. This analysis reveals that approximately 35% of stormwater run-off develops within the Single Family zoning areas. However, Business and Industrial zoning areas are also significant contributors. It is important to note that this calculation excludes areas which are largely undeveloped (see **Figure 5**, Sewer Sections 22 - A, B, C, D, E, and F on the following page), assuming all new development will require separate storm and sanitary sewers.

Wood River, IL - Long Term CSO Control Plan
Existing Combined Wastewater Treatment Facilities
Process Flow Diagram

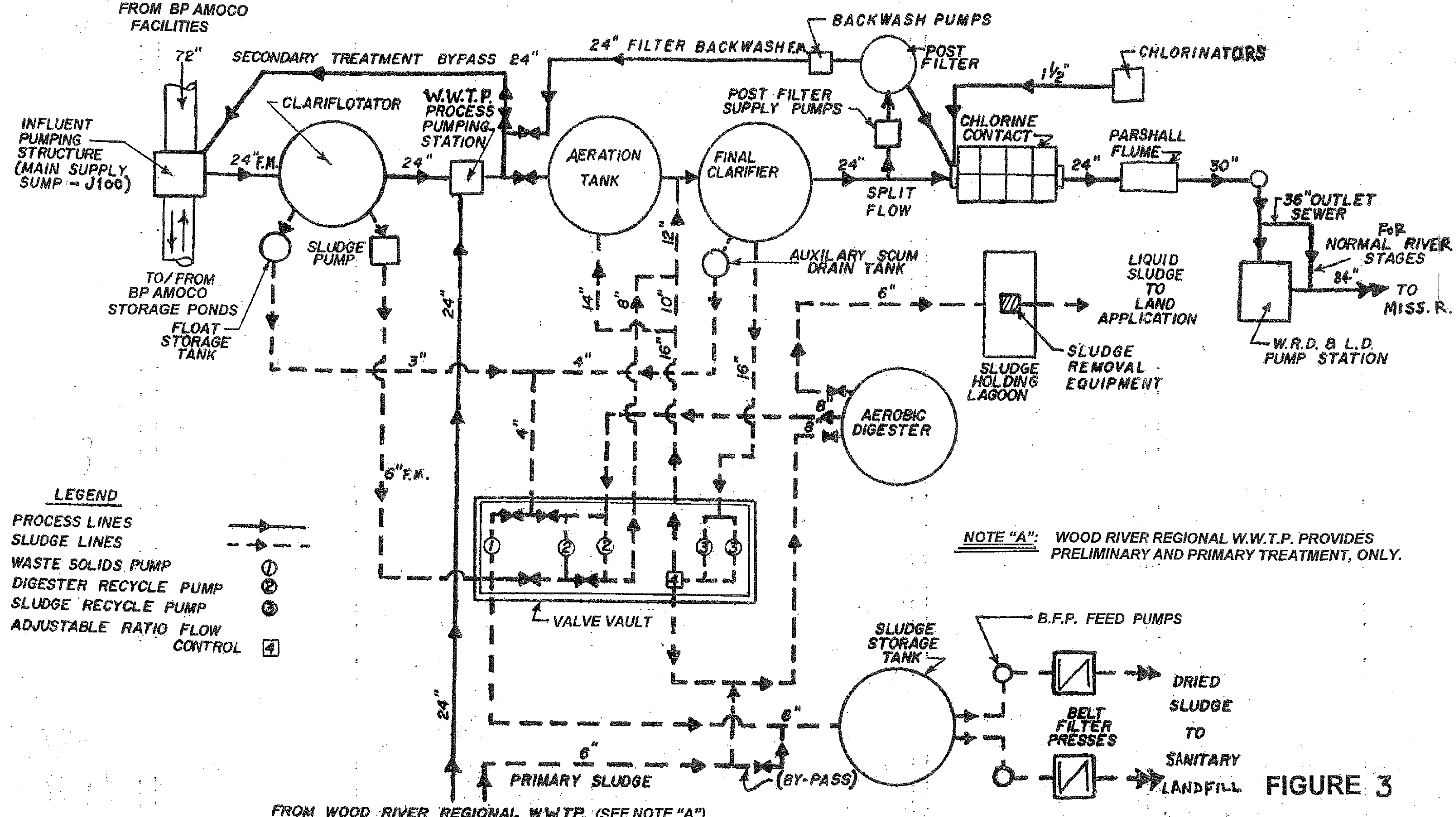


FIGURE 3

WOOD RIVER, ILLINOIS CSO LTCP

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640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

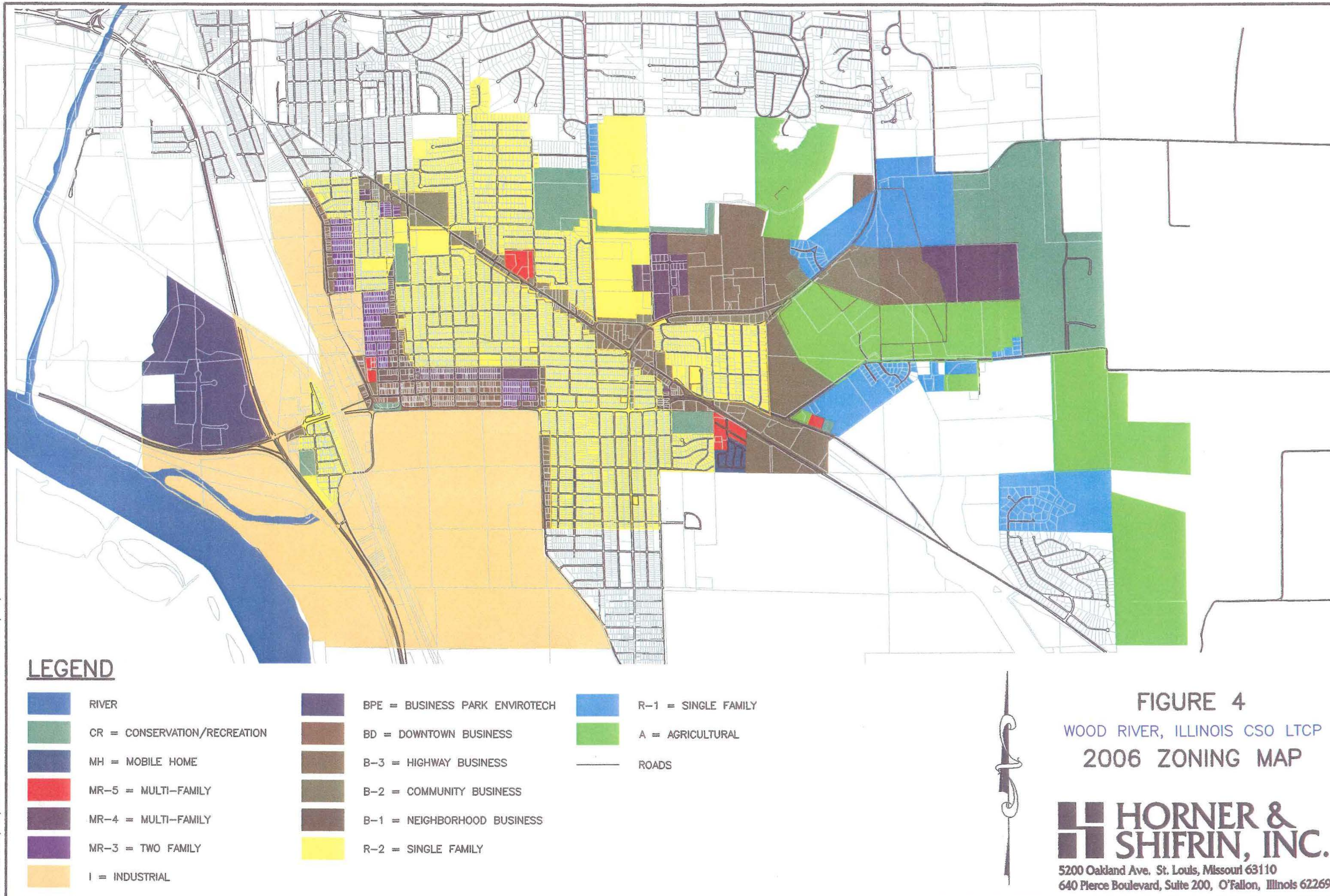

FIGURE 4
WOOD RIVER, ILLINOIS CSO LTCP
2006 ZONING MAP

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640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

This data was then used to compare the amount of stormwater run-off entering the combined sewer system within each sewer section by utilizing a ratio of the amount of run-off entering the combined sewers to the total acreage of the sewer section. Again, it is important to note that certain zoning areas are largely undeveloped, and are not included in this calculation due to the assumption that all undeveloped areas would require separate storm and sanitary sewers (see **Figure 5**, Sewer Sections 22 - A, B, C, D, E, and F).

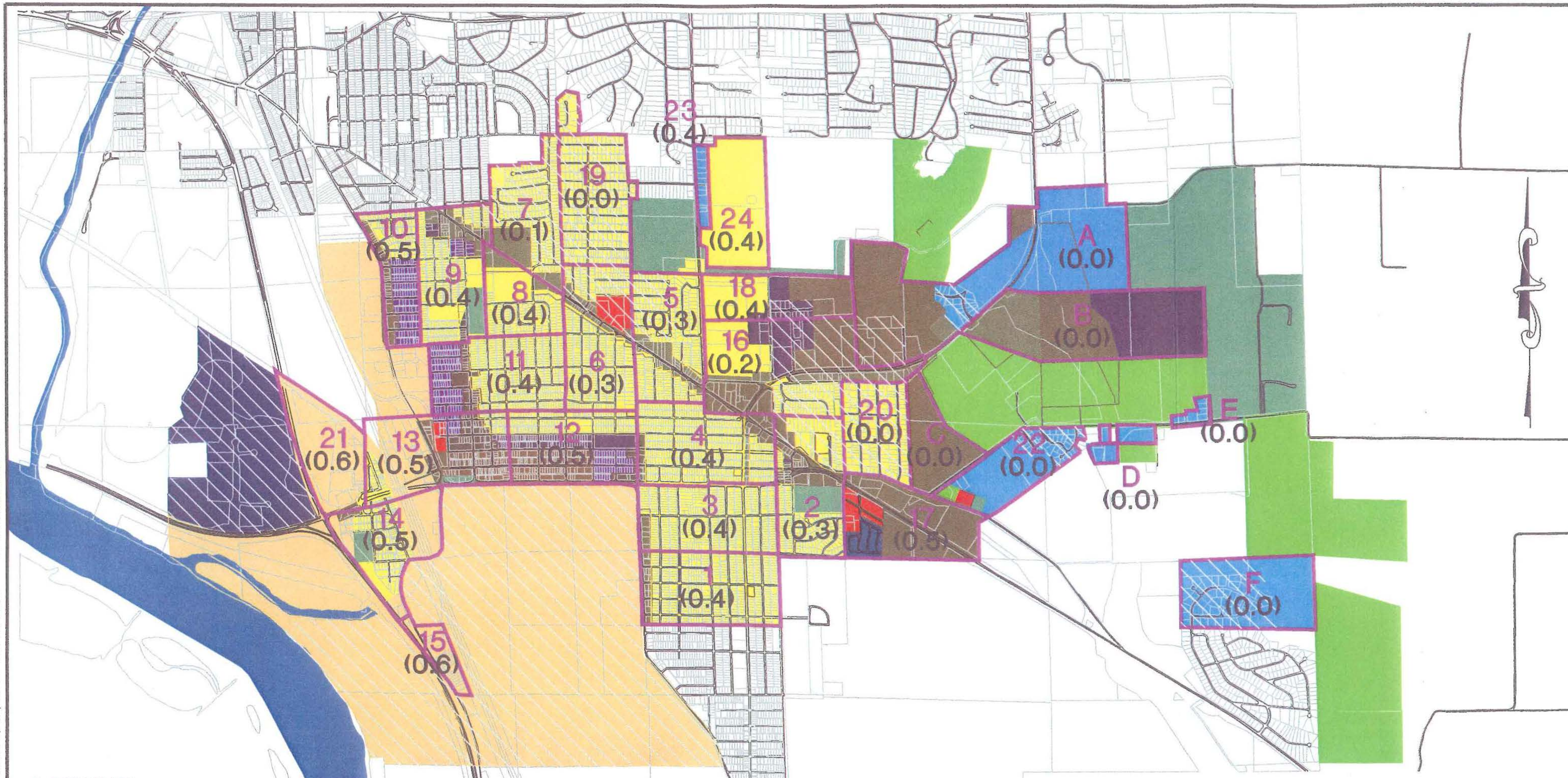
The results of this analysis can be determined from **Figure 5** by reviewing each Section of sewer analyzed and the above-described ratio. This review reveals that Sewer Sections 10, 12, 13, 14, 15, 17, and 21 are the highest contributors of stormwater. Historically, hydraulic problems within the Wood River sewer system have been further concentrated in two areas, often creating localized flooding.

One of these problem areas has been along Madison Avenue, where heavy rains cause roadway flooding due to backups of 60 to 65 inlets to the sewer system. The second area has been around the intersection of Central and Hawthorne roads, where surface flooding and basement backups into 300 homes has occurred during heavy rains.

Total storm water runoff into the combined sewers using the "Rational Method" and a design storm of one-hour three-month rainfall intensity is 19.75 MG. It is assumed that if capacity for storage or treatment was made available for 19.75 MG, this would reduce the overall average of CSO discharge events per year to four or less. This assumption is further supported by information presented in Section II.C. of this LTCP.

Although approximately 2.5 MGD of capacity at the Wood River Wastewater Treatment Plant is currently available for treating wet weather flows, it does not significantly reduce the volume of runoff for which capacity must be made for through the implementation of this LTCP.

All calculations used to characterize the sewer system and stormwater run-off flows using the Rational Method, as well as detailed breakdowns of each contributing zoning area in individual sewer map sections, can be found in **<u>Appendix C</u>** of this LTCP.



LEGEND

RIVER	BPE = BUSINESS PARK ENVIROTECH
CR = CONSERVATION/RECREATION	BD = DOWNTOWN BUSINESS
MH = MOBILE HOME	B-3 = HIGHWAY BUSINESS
MR-5 = MULTI-FAMILY	B-2 = COMMUNITY BUSINESS
MR-4 = MULTI-FAMILY	B-1 = NEIGHBORHOOD BUSINESS
MR-3 = TWO FAMILY	R-2 = SINGLE FAMILY
I = INDUSTRIAL	R-1 = SINGLE FAMILY

A = AGRICULTURAL

SEPERATED SEWER

ROADS

SEWER SYSTEM SECTION BOUNDARY

1-24 SEWER SYSTEM MAP SECTIONS

A-F ADDITIONAL SEWER SYSTEM SECTIONS

FIGURE 5

WOOD RIVER, ILLINOIS CSO LTCP

SEWER SYSTEM SECTIONS, ZONING INFORMATION, AND FLOW CONTRIBUTION RATIO

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Table 1 – Acres Covered by Each Zoning Section and Percentage of Total Area

Zoning Area	Acres Covered	Percent of Total Area
Mobile Home	11	0.3%
Multi Family 5	27	0.6%
Neighborhood Business	33	0.8%
Downtown Business	43	1.0%
Two Family	58	1.4%
Community Business	123	2.9%
Multi family 4	131	3.1%
Business Park	171	4.1%
Single Family R1	290	7.0%
Conservation/Recreation	331	7.9%
Highway Business	470	11.3%
Agricultural	553	13.3%
Single Family R2	953	22.9%
Industrial	974	23.4%

Table 2 – Percent Contribution of Stormwater Runoff to Combined Sewers by Zoning Area

Zoning Area	Percent of Total Stormwater Entering CSS
Agricultural	0.0%
Business Park	0.0%
Mobile Home	0.7%
Conservation/Recreation	1.0%
Multi family 5	1.1%
Neighborhood Business	2.5%
Multi family 4	2.8%
Downtown Business	3.3%
Two Family	3.8%
Community Business	5.6%
Single Family R1	14.1%
Highway Business	19.7%
Single Family R2	21.5%
Industrial	23.8%

C. Characterization of CSO Discharges

Data on the frequency and duration of CSO discharge events collected by the City of Wood River between January 2002 and December 2005, for the purposes of NPDES Permit reporting, was evaluated by Horner & Shifrin. On average, the City of Wood River has had 29 CSO discharge events per year, with approximately 18 events occurring May thru October and 11 events occurring November thru April, during the 48 month period for which data was analyzed.

29

Historically, May has had the highest number of CSO discharge events, with an average of 4 events per month; followed by June and August, with an average of 3.25 events per month. December has the lowest amount of CSO events, averaging one event per month. The average duration of a typical CSO discharge event was 3.6 hours, with a maximum duration event of 20 hours occurring in May 2004. The overall frequency and duration distribution of the 29 CSO discharge events occurring between January 2002 and December 2005 is presented in **Table 3**, on Page II-7.

Data on the parameters typically used to assess the potential water quality impact of CSO discharge events, taken from the City's NPDES Permit reporting during the period from January 2002 to December 2005, was also compiled and analyzed by Horner & Shifrin, Inc. However, the data collected for periods before July 2002 was not included in this evaluation, due to the fact that only one sampling point located downstream of the Wastewater Treatment Plant effluent connection back into the 84" interceptor sewer existed prior to July 22, 2002. Data from this one sampling point is considered to be non-representative of the quality of the CSO discharge events, because the samples used for analysis consisted of both wastewater treatment plant effluent and combined sewer overflows.

Using only the data then from July 2002 to December 2005 then, the average BOD concentration in the CSO discharges was 81 mg/L, with a maximum concentration of 563 mg/L. The average TSS concentration in the CSO discharges was 186 mg/L, with a maximum concentration of 790 mg/L. The average fecal coliform count was 1,214,522 (No./100 mL), with a maximum fecal coliform count of 11,000,000 (No./100 mL). Statistical calculations were performed using this data to determine typical contaminant loadings per CSO event. The resulting typical BOD loading per event was 2,716 lb, while the typical TSS loading per event was 5,864 lbs.

The average annual CSO discharge flows and loadings were computed by Horner & Shifrin, Inc. using data gathered between January 2003 and December 2005. Data collected before 2003 could not be utilized due to the data collection in 2002 not spanning an entire year (due to the reasons discussed above). Using only the data from 2003, 2004, and 2005, the estimated average yearly CSO discharge flow was 252.2 million gallons. The average BOD and TSS loading were estimated to be 153,000 lbs per year and 339,000 lbs per year, respectively.

It should be noted that these values only give a general idea of the characteristics of a CSO discharge event. This is because the data analyzed consists of only one sample per CSO discharge event. The parameters in which these samples are tested can vary widely between CSO events, and over time during a single CSO event due to factors such as season, time span since last rainfall, intensity and duration of rainfall, and time elapsed between start of CSO discharge and sample collection.

Average total CSO flows, BOD loading, TSS loading, average and maximum BOD and TSS concentrations, as well as average and maximum fecal coliform counts are presented in **Tables 3 through 7**, presented on Pages II-7 and II-8.

Data from NPDES Permit reporting and additional data provided by the Wood River Wastewater Treatment Plant can be found in **Appendix D** of this LTCP. All data analysis that support these findings, can be found herein in **Appendix E**.

D. Characterization of Receiving Stream

Water quality standards in the stretch of the Mississippi River around the Wood River CSO outfall (defined as segment J-05) are promulgated by the Illinois Pollution Control Board and approved by USEPA. According to the latest USEPA-approved Water Quality Report in 2004, the assessment of this stretch of the Mississippi River showed both impairment of the Fish Consumption Use due to PCBs, and impairment of the Public Water Supply Use due to manganese. However, the more-recent IEPA Water Quality Report (submitted to USEPA in mid-April 2006), is still awaiting approval by USEPA.

It is of particular significance for Wood River's CSO LTCP development that this yet-to-be-approved 2006 Water Quality Report also lists Primary Contact Use to be impaired due to fecal coliform. The addition of Primary Contact Use impairment to the 2006 IEPA Water Quality Report is reportedly due to a more restrictive assessment methodology which had the support of USEPA, and thus the 2006 IEPA Water Quality Report is expected to obtain USEPA approval.

Table 3 – **City of Wood River CSO Occurrences (January 2002 thru December 2005)**

Year	Number of Events (May-Oct.)	Number of Events (Nov.-April)	Total Number Of Events	Avg. Duration of CSO Event (hr) (May-Oct.)	Avg. Duration of CSO Event (hr) (Nov.-April)	Avg. Annual Duration of CSO Events (hr)	Maximum Duration of CSO Events (hr)
2002	21	11	32	3.0	2.9	3.0	16.0
2003	12	16	28	2.8	2.6	2.7	7.0
2004	21	9	30	4.1	3.4	3.9	20.0
2005	17	9	26	3.5	6.7	4.6	16.0
Average	**18**	**11**	**29**	**3.4**	**3.9**	**3.6**	--

Table 4 – **CSO Average / Maximum BOD & TSS Concentrations (July 2002 thru December 2005)**

Year	Average [BOD] in CSOs (mg/L)	Maximum [BOD] in CSOs (mg/L)	Average [TSS] in CSOs (mg/L)	Maximum [TSS] in CSOs (mg/L)
2002	68	330	200	622
2003	107	563	224	790
2004	60	189	122	349
2005	88	339	198	528
Average	**81**	--	**186**	--

Table 5 – CSO Maximum Fecal Coliform Counts (July 2002 thru December 2005)

Year	Maximum Fecal Coliform Count (No./100 mL)
2002	3,050,000
2003	11,000,000
2004	7,500,000
2005	5,900,000
Average	--

Table 6 – CSO BOD Loading (January 2003 thru December 2005)

Year	Estimated Annual Total CSO Flow (MG)	Estimated Annual BOD Loading (1000 Lbs.)
2003	177	93
2004	299	141
2005	281	226
Average	252.2	153

Table 7 – CSO TSS Loading (January 2003 thru December 2005)

Year	Estimated Annual Total CSO Flow (MG)	Estimated Annual TSS Loading (1000 Lbs.)
2003	177	240
2004	299	288
2005	281	489
Average	252.2	339

The regulation which specifies Water Quality Standards for Primary Contact Use is found in the Illinois Pollution Control Board Regulations Part 302, General Use Water Quality Standard: Subpart B (see **Appendix F** of this LTCP). The General Use Water Quality Standard, Section 209, specifies that during the months of May through October, fecal coliform bacteria counts shall not exceed a geometric mean of 200 per 100 mL based on a minimum of five samples taken over not more than a 30 day period, nor shall more than 10 percent of the samples taken during a 30 day period exceed 400 per 100 mL.

The lone Wood River CSO outfall discharges to the Mississippi River at River Mile 198.00. Daily samples of river water are analyzed to characterize source (raw) water by American Water Company (AWC) at their Alton Intake (upstream of the CSO outfall, at river mile 204.2, feeding the Alton Water Treatment Facility) and at their Choteau Island Intake (downstream of the CSO outfall, at River Mile 192.0, feeding both the Granite City Water Treatment Facility and the East St. Louis Water Treatment Facility). Fecal Coliform data on raw water from these two intakes was obtained and evaluated by Horner & Shifrin to develop baseline receiving stream water quality between January 2002 and December 2005. Raw data from AWC's sampling and testing of their Alton and Choteau Island Mississippi River source water intakes can be found in **Appendix G** and **Appendix H**, respectively, of this LTCP.

The geometric mean, calculated per month during the months of April thru October, as well as the percentage of samples over 400/100 mL for the Alton and Choteau Island Intakes can be seen in **Table 8** and **Table 9** (presented on Page II-10). The shaded areas in these Tables show values which exceed Illinois Pollution Control Board Regulations Part 302, General Use Water Quality Standard, Section 209 Fecal Coliform limits. Spreadsheets used to calculate this data can be found in **Appendix I** of this LTCP.

As shown in **Table 8** and **Table 9**, between the months of May thru October in 2002, 2003, and 2004, the geometric mean of the fecal coliform samples for all months exceeded IEPA Water Quality Standards at both the Alton and Choteau Island Intakes. However, in 2005 this trend seemed to change dramatically at the Alton Intake, with only two exceedances in the geometric mean, occurring in June and October. Lower values of the geometric mean were also seen at the Choteau Island Intake in 2005, but all values were still above 200 per 100 mL.

The second element of the fecal coliform water quality standard (that no more than ten percent of samples exceed 400 per 100 mL) is a much more difficult requirement to meet than a geometric mean below 200 per 100 mL. Data in **Table 8** and **Table 9** show that, over the past 4 years, this standard has only been met twice; both times occurring at the Alton Intake in 2005. This data clearly shows that the Illinois Pollution Control Board's General Use Water Quality Standard for fecal coliform has not been attained in the Mississippi River during the time frame analyzed, either upstream or downstream of Wood River's CSO outfall.

Comparison between **Table 8** and **Table 9** does imply that Mississippi River fecal coliform concentration typically increases between the Alton and Choteau Island Intakes. The monthly geometric mean at the Choteau Island Intake is higher than the upstream value at the Alton Intake nearly 75% of the time during May thru October between 2002 and 2005. However, it should be noted that it is highly unlikely that this increase in fecal coliform concentration between the Alton and Choteau Island Intakes could be attributed entirely to the Wood River CSO outfall. Data from the EPA database *Envirofacts* shows that there are five NPDES permitted dischargers between the Alton Intake and the Wood River CSO outfall, and nine NPDES permitted dischargers between the Wood River CSO outfall and the Choteau Island Intake. These NPDES permitted dischargers, along with their associated SIC code, SIC business description, discharge description, and discharge location are summarized in **Table 10** and **Table 11**, presented on Page II-12. Also, **Figure 6**, on the following page, shows the location of AWC's raw water intakes, the Wood River CSO outfall, and other NPDES permitted discharge points of interest in the area of Wood River's CSO outfall.

LEGEND

UPSTREAM OF CSO OUTFALL
- 1 ALTON STEEL
- 2 DYNEGY MIDWEST
- 3 OLIN CORPORATION
- 4 EAST ALTON STP
- 5 KOCH NITROGEN

DOWNSTREAM OF CSO OUTFALL
- 6 BP AMOCO
- 7 HARTFORD CSO
- 8 PREMCOR REFINING GROUP
- 9 CONOCO PHILLIPS
- 10 NATIONAL MAINTENANCE AND REPAIR
- 11 KOCH PIPELINE
- 12 EXPLORER PIPELINE
- 13 CONOCO PHILLIPS
- 14 EAST ALTON WTP

DRINKING WATER INTAKES
- 15 DRINKING WATER INTAKE – CHOTEAU ISLAND (AMERICAN WATER CO.)
- 16 DRINKING WATER INTAKE – ALTON (AMERICAN WATER CO.)

CSO OUTFALL
- 17 WOOD RIVER CSO

FIGURE 6

WOOD RIVER, ILLINOIS CSO LTCP

NPDES–PERMITTED DISCHARGES AND DRINKING WATER INTAKES NEAR THE WOOD RIVER CSO

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640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

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Table 8 – **Alton Raw Water Intake Fecal Coliform Data (2002 thru 2005)**

	Geometric Mean				% > 400			
	2002	2003	2004	2005	2002	2003	2004	2005
May	1617	1708	777	165	90.0	89	58	10
June	962	1047	1115	379	85.0	90.5	100	35
July	577	613	730	180	65.0	65.0	75	11
August	441	467	535	159	45.5	61.9	60	10
Sept.	275	559	378	159	31.6	61.9	47	13
Oct	640	605	859	269	68.2	77.3	74	21

*Note: Shaded areas show values which exceed IPCB Regulations Part 302, General Use Water Quality Standard, Section 209 Fecal Coliform.

Table 9 – **Choteau Island Raw Water Intake Fecal Coliform Data (2002 thru 2005)**

	Geometric Mean				% > 400			
	2002	2003	2004	2005	2002	2003	2004	2005
May	2799	1738	1297	227	100	89	70	15
June	1571	1242	1055	371	95	89	100.0	43
July		720	837	305		68	81	37
August	675	422	1282	299	59	52	86	32
Sept.	617	974	366	458	56	70.0	38	40
Oct	1079	463	766	309	91	48	65.0	33

*Note: Shaded areas show values which exceed IPCB Regulations Part 302, General Use Water Quality Standard, Section 209 Fecal Coliform.

Another factor that influences water quality between the Alton and Choteau Island Intakes is the convergence of the Missouri River and the Mississippi River, which occurs approximately three river miles upstream of the Choteau Island Intake. This confluence introduces pollutants from sources in the Missouri River to the relatively cleaner Mississippi River, as well as increases the volume of the Mississippi River. In order to actually quantify the effect this convergence has on water quality, samples of the Missouri River would need to be analyzed and average river flows determined. Water quality data from the Missouri R. would then need to be compared with the water quality data from the Mississippi R. to define the pollutant loads carried by each River, and the combined effect on the water quality following convergence. Such an effort is beyond the scope of this LTCP.

One other way to postulate the impact of CSO discharges on the Mississippi River would be to use a simple mass balance approach to estimate the resulting fecal count in the Mississippi River directly downstream of the Wood River CSO outfall during a CSO discharge event. This requires the use of daily river flow values, NPDES Permit reporting data (including amount discharged, estimated duration, and fecal coliform count for the CSO discharge event), and upstream fecal coliform counts from the Alton Intake. Although this approach has to be based on many assumptions (including that no additional sources of fecal coliform enter the Mississippi River between the Alton Intake and the Wood River CSO outfall, that one fecal coliform sample is representative of the entire CSO discharge, and that the operations staff's estimates of duration and flow are reasonably accurate), some useful results might be obtained.

Analysis based on the above-outlined approach and assumptions for the period between September 2002 and September 2005 reveals that, on average, Wood River's CSO discharges could increase fecal coliform levels in the Mississippi River by 1,697 per 100 mL. The maximum increase in fecal coliform levels in the Mississippi River due to a Wood River CSO discharge event was estimated to be 11,288 per 100 mL, while the minimum was estimated to be 3 per 100 mL.

It is important to note that the data used for this analysis ranged between September of 2002 and September of 2005 for which both estimated fecal coliform release from a CSO discharge event and fecal coliform samples at the Alton Intake were available. Mean daily stream flows between September 2002 and September 2005 were obtained from the United States Geological Service (USGS) for the Grafton, Illinois U.S. Army Corp of Engineers Station No. 05587450.

Data obtained from the USGS online database can be found in **Appendix J** of this LTCP. Data from NPDES Permit reporting, and fecal coliform data from AWC's Alton Intake, can be found herein in **Appendix D** and **Appendix G**, respectively. Spreadsheet calculations to support the findings presented above can be found in **Appendix K** of this LTCP.

Mean velocity data was also obtained for the Mississippi River at Grafton, Illinois between 1986 and 2006, using the USGS online database (see **Appendix J** of this LTCP). This data was averaged to obtain a mean stream velocity of 2.2 ft / sec. Neglecting the effects that the convergence of the Missouri and Mississippi Rivers may have on the velocity of the Mississippi River downstream of the convergence, the time needed for releases during Wood River CSO discharge events to reach the Choteau Island Intake would be approximately 4 hours (see **Appendix K** of this LTCP for supporting calculations).

Table 10 – **NPDES Permitted Discharges Upstream of the Wood River CSO Outfall**

Map Number	Facility Name	SIC Code	SIC Description	Discharge Description	Discharge Location
1	**Alton Steel**	3315	Steel Wire Draw & Steel Nails	Groundwater; Seepage; Sanitary wastewater; Stormwater	Mississippi River
2	**Dynegy Midwest**	4911	Electrical Services	Condensed cooling water; Pond discharge; Stormwater; Intake screen backwash; metal cleaning; Chemical Activated carbon treatment	Mississippi River
3	**Olin Corporation**	3351 3398 3482	Rolling, Drawing, and Extruding of Copper Metal Heat Treating Small Arms Ammunition	Stormwater	Wood River, Mississippi River
4	**East Alton STP**	4952	Sewage Systems	Treated WWTP effluent	Wood River, Mississippi River
5	**Koch Nitrogen**	4226	Special Warehousing & Storage	Non-contact cooling water	Old Wood River Channel, Trib. To Mississippi River

Table 11 – **NPDES Permitted Discharges Downstream of the Wood River CSO Outfall**

Map Number	Facility Name	SIC Code	SIC Description	Discharge Description	Discharge Location
6	**BP Amoco**	5171	Petroleum Bulk Stations & Terminal	Surge pond emergency overflows	Mississippi River
7	**Hartford CSO**	4952	Sewage Systems	CSO West Hawthorne Road	Mississippi River
8	**Premcor Refining Group**	5171	Petroleum Bulk Stations	Treated process, sanitary, and stormwater; Stormwater	Unnamed Ditch Tributary to Mississippi River
9	**Conoco Phillips**	2911	Petroleum Refining	Treated process, sanitary, and stormwater; Stormwater	Mississippi River
10	**National Maintenance and Repair**	3751	Ship Building & Repair	Stormwater; Barge list water; Dry dock water; Stormwater	Mississippi River
11	**Koch Pipeline**	1422	Crushed & Broken Limestone	Hydrostatic testing effluent; Stormwater	Tributary to Retention Pond, Mississippi River
12	**Explorer Pipeline**	4613	Refined Petroleum Pipeline	Waterdraw; Hydrostatic testing effluent; Stormwater	Cahokia Canal Tributary to Mississippi River
13	**Conoco Phillips**	5171 2992	Petroleum Bulk Station & Terminal Lubricating Oils & Grease	Hydrostatic testing effluent	Cahokia Diversion Channel Tributary to Mississippi River
14	**East Alton WTP**	4941	Water Supply	Treated groundwater	Cahokia Diversion Channel Tributary to Mississippi River

E. Data Period Analyzed

Due to lack of rainfall events of sufficient intensity / duration to produce combined sewer overflow (CSO) discharges from the City of Wood River's sewer system, the effort to complete this CSO Long Term Control Plan (LTCP) had to be extended by several months beyond the originally-anticipated completion date of November 2006. As a result, data / information was originally gathered and analyzed for this LTCP during the first few months of 2006, generally covering the period from January 2002 to December 2005 (where such a span of historical information was available for a given parameter).

The effort to prepare this LTCP was ultimately delayed, by the lack of CSO-producing wet weather events, to the point where data for the entire calendar year 2006 did become available, for many of the parameters evaluated. However, it was determined by City staff and Horner & Shifrin personnel that the possible benefits to be gained from an effort to gather and analyze this additional data for 2006 (in order to "refine" the analysis / conclusions obtained through review of the years 2002 through 2005 data) was far outweighed by the cost involved in that effort.

For that reason, even though this LTCP was not completed until mid-2007, no data from year 2006 has been included herein, or analyzed. Moreover, H & S personnel do not believe that further analysis of 2006 data would have revealed any differences from the analysis of the years 2002 though 2005 data which would be significant enough to alter the conclusions reached in this LTCP from the review / analysis of the 2002 through 2005 data.

END OF SECTION II.

III. MONITORING / MODELING ACTIVITIES

Additional sampling and analytical testing of Wood River's CSO flows, as well as the Mississippi River in the vicinity of the City's CSO outfall, were completed in order to more accurately assess the potential affect of Wood River's CSO discharges on the Mississippi River. Sampling, testing, and monitoring was completed based on the EPA approved "Proposed Sampling Plan for Characterization of the Mississippi River and CSO Discharge Flows for CSO Long Term Control Plan Development", as revised in September 2006, which can be found herein as **Appendix L**.

Sampling of the Mississippi River was completed both during dry weather and CSO discharge events at designated locations upstream and downstream of the CSO outfall. These areas are approximately at points 0.5 mile upstream from the CSO outfall, and 0.4 miles downstream of the CSO outfall. Pictures showing these sampling locations are included herein as **Appendix M**.

Mississippi River sampling during dry weather occurred three times over the course of the sampling period in order to obtain a baseline level of contaminants. River samples were taken from approximately one foot under the surface of the water through the use of an extension device. Sampling of the Mississippi River also occurred in conjunction with CSO sampling during three CSO discharge events. Samples of the CSO discharge flow and Mississippi River were taken at one-half hour intervals for the first three hours of CSO discharge, and once an hour from the fourth hour to the end of the event. Samples of the CSO discharge are taken from the CSO outfall through the use of a sampling bucket. It is important to note that wastewater treatment plant effluent also discharges at this location. Pictures showing the sampling apparatus as well as the general vicinity of the outfall are also included in **Appendix M**.

The parameters for which all samples were analyzed is BOD, COD, fecal coliform, total nitrogen, and phosphorous. A flow measurement device was also installed during the sampling period in order to get more accurate readings of CSO flows and total discharge amounts. The following sections describe the results of this characterization effort.

A. Mississippi River Monitoring Results (Dry Weather)

As required by the sampling plan (**Appendix L**), samples were obtained from the Mississippi River and the Wood River Wastewater Treatment Plant effluent during dry weather on three separate occasions to obtain a sense of the baseline for the pollutants of interest. Sampling during dry weather was conducted in the same locations, using the same procedures, as that during wet weather. Results of these three sampling events, and associated averages can be seen in **Table 12** on the following page.

Table 12 **Mississippi River Monitoring Results (Dry Weather)**

Sampling Event #1 -- March 20, 2007

	Upstream (10:30 AM)	Final Effluent (11:00 AM)	Downstream (10:40 AM)
TSS (mg/L)	127	7	152
Nitrogen, Ammonia (as N; mg/L)	0.27	< 0.1	0.27
Phosphorous, Total (as P;mg/L)	0.513	0.859	0.522
BOD (mg/L)	< 5	5	< 5
Fecal Coliform (CFU/100 mL)	810	6100	140

Sampling Event # 2 -- March 27, 2007

	Upstream (11:45 AM)	Final Effluent (12:12 PM)	Downstream (12:00 PM)
TSS (mg/L)	155	8	449
Nitrogen, Ammonia (as N; mg/L)	0.37	< 0.1	0.24
Phosphorous, Total (as P;mg/L)	0.158	0.75	0.227
BOD (mg/L)	< 5	< 5	< 5
Fecal Coliform (CFU/100 mL)	140	2000	160

Sampling Event #3 -- April 10, 2007

	Upstream (8:30 AM)	Final Effluent (12:12 PM)	Downstream (12:00 PM)
TSS (mg/L)	60	11	62
Nitrogen, Ammonia (as N; mg/L)	< 0.1	< 0.1	< 0.1
Phosphorous, Total (as P;mg/L)	0.169	0.484	0.169
BOD (mg/L)	< 5	< 5	< 5
Fecal Coliform (CFU/100 mL)	175	21800	390

Overall Averages of Mississippi River (Dry Weather) Sampling

	Upstream	Final Effluent	Downstream
TSS (mg/L)	114	8.7	221
Nitrogen, Ammonia (as N; mg/L)	0.25	< 0.1	0.2
Phosphorous, Total (as P;mg/L)	0.28	0.7	0.3
BOD (mg/L)	< 5	5.0	< 5
Fecal Coliform (CFU/100 mL)	375	9967	230

As can be seen by the data presented in **Table 12**, most of the parameters that were analyzed vary widely not only between sampling events, but between the samples taken upstream and downstream of the outfall. The variation in the parameters reported here between sampling events is expected since many factors can affect the water quality of the Mississippi River on any given day, including rain events and/or discharges from other sources many miles upstream of Wood River, Illinois. Large discrepancy in the parameters between upstream and downstream samples taken on the same day is less expected due to the relatively short distance between the two sampling points (approximately 1 mile), and the low impact expected from the Wood River Wastewater Treatment Plant effluent. Proximity of the sampling points to the bank of the river may be a cause of some of the wide variations seen between the upstream and downstream samples due to a shallow depth for sample collection and possible stagnancy. However, this was unavoidable since sampling procedures for both wet and dry weather sampling events need to be consistent, and it was deemed dangerous for WWTP staff to retrieve samples from a boat in the middle of the river during a rain event.

Another issue worth noting about the data shown in **Table 12** is that there are two instances where samples taken upstream of the outfall contain higher levels of pollutants than that seen in downstream samples. This is generally not expected since the Wood River Wastewater Treatment Plant effluent discharges to the river between the upstream and downstream sampling points, and thus adds to the pollutant loading. Again, this is possibly due to the location of sample collection proximity to the bank.

Obviously, more sampling events would have yielded a more accurate picture of the average pollutant levels in the Mississippi River. However, the data collected is useful to compare to the pollutant levels found in the river during wet weather events, which is discussed in the next section. All analysis reports and chain of custody information for the dry weather sampling can be found in **Appendix N**, while the analysis of this data can be found in **Appendix P.**

B. CSO Discharge and Mississippi River Monitoring Results (CSO Events)

As required by the sampling plan (**Appendix L**), samples were obtained from the CSO discharge during wet weather on three separate occasions to obtain a better understanding of the pollutant loads of the CSO discharge and how they can vary over the duration of the CSO event, as well as the pollutant loads in the Mississippi River upstream and downstream of the outfall. The goal was to ultimately get a feel for the impact that Wood River's CSOs may have on the river, as well as a reference point in determining if pollutant loads to the river are reduced due to implementation of this CSO LTCP. Sampling during CSO events was conducted in the same locations, using the same procedures, as that during dry weather. Samples were taken at approximately half hour intervals during the first three hours after a CSO event began, and at one hour intervals after that until the end of the CSO event. Results of these three sampling events can be seen in **Table 13** on the following pages. This data is graphically represented in **Figures 7, 8, and 9**, directly following **Table 13.**

The information presented in **Figure 7** for the sampling event on March 30th, 2007 seems to follow the expected trend, with pollutant loads of the CSO discharge generally decreasing over the duration of the CSO event, and either the same or slightly higher pollutant loadings downstream of the outfall as compared to upstream. The phosphorous concentration in the second upstream sample seems to be erroneous. Several factors may have been responsible for this, including the previously mentioned issue of the proximity of the upstream and downstream sampling points to the bank of the Mississippi River.

<u>Table 13</u> CSO Discharge and Mississippi River Monitoring Results (CSO Events)

Sampling Event #1 -- March 30, 2007

	Upstream	CSO/Final Effluent	Downstream
Time	11:37 AM	11:55 AM	11:48 AM
TSS (mg/L)	129	336	78
Nitrogen, Ammonia (as N; mg/L)	0.14	1.45	0.3
Phosphorous, Total (as P;mg/L)	0.103	0.858	0.82
BOD (mg/L)	< 5	78	< 5
Fecal Coliform (CFU/100 mL)	276	245000	148
Time	12:35 PM	12:52 PM	12:46 PM
TSS (mg/L)	95	213	79
Nitrogen, Ammonia (as N; mg/L)	0.17	1.1	0.26
Phosphorous, Total (as P;mg/L)	1.14	0.707	0.625
BOD (mg/L)	< 5	63	5
Fecal Coliform (CFU/100 mL)	18	167000	17500
Time	1:10 PM	1:25 PM	1:18 PM
TSS (mg/L)	126	110	167
Nitrogen, Ammonia (as N; mg/L)	0.15	1.15	0.24
Phosphorous, Total (as P;mg/L)	0.151	0.754	0.189
BOD (mg/L)	< 5	40	< 5
Fecal Coliform (CFU/100 mL)	216	231000	12800
Time	1:51 PM	1:40 PM	2:02 PM
TSS (mg/L)	152	32	127
Nitrogen, Ammonia (as N; mg/L)	0.17	0.62	0.19
Phosphorous, Total (as P;mg/L)	0.139	0.738	0.345
BOD (mg/L)	< 5	< 5	< 5
Fecal Coliform (CFU/100 mL)	400	95000	9200

Table 13 **CSO Discharge and Mississippi River Monitoring Results (CSO Events) (cont.)**

Sampling Event # 2 -- April 3, 2007

	Upstream	CSO/Final Effluent	Downstream
Time	12:00 PM	12:20 PM	12:10 PM
TSS (mg/L)	93	270	100
Nitrogen, Ammonia (as N; mg/L)	< 0.1	0.83	< 0.1
Phosphorous, Total (as P;mg/L)	0.288	0.622	0.304
BOD (mg/L)	< 5	47	< 5
Fecal Coliform (CFU/100 mL)	240	142000	142
Time	12:40 PM	12:50 PM	12:45 PM
TSS (mg/L)	73	152	137
Nitrogen, Ammonia (as N; mg/L)	< 0.1	1.57	0.15
Phosphorous, Total (as P;mg/L)	0.565	0.657	0.274
BOD (mg/L)	< 5	44	< 5
Fecal Coliform (CFU/100 mL)	64	223000	13600
Time	1:30 PM	1:40 PM	1:35 PM
TSS (mg/L)	80	130	41
Nitrogen, Ammonia (as N; mg/L)	< 0.1	1.92	0.11
Phosphorous, Total (as P;mg/L)	0.349	0.492	0.411
BOD (mg/L)	< 5	52	< 5
Fecal Coliform (CFU/100 mL)	98	235000	10100

Table 13 CSO Discharge and Mississippi River Monitoring Results (CSO Events) (cont.)

*********************** **Note: Sampling Event #3 has yet to occur** **********************

Figure 7 March 30, 2007 CSO Discharge and Mississippi River Monitoring Results (CSO Event)

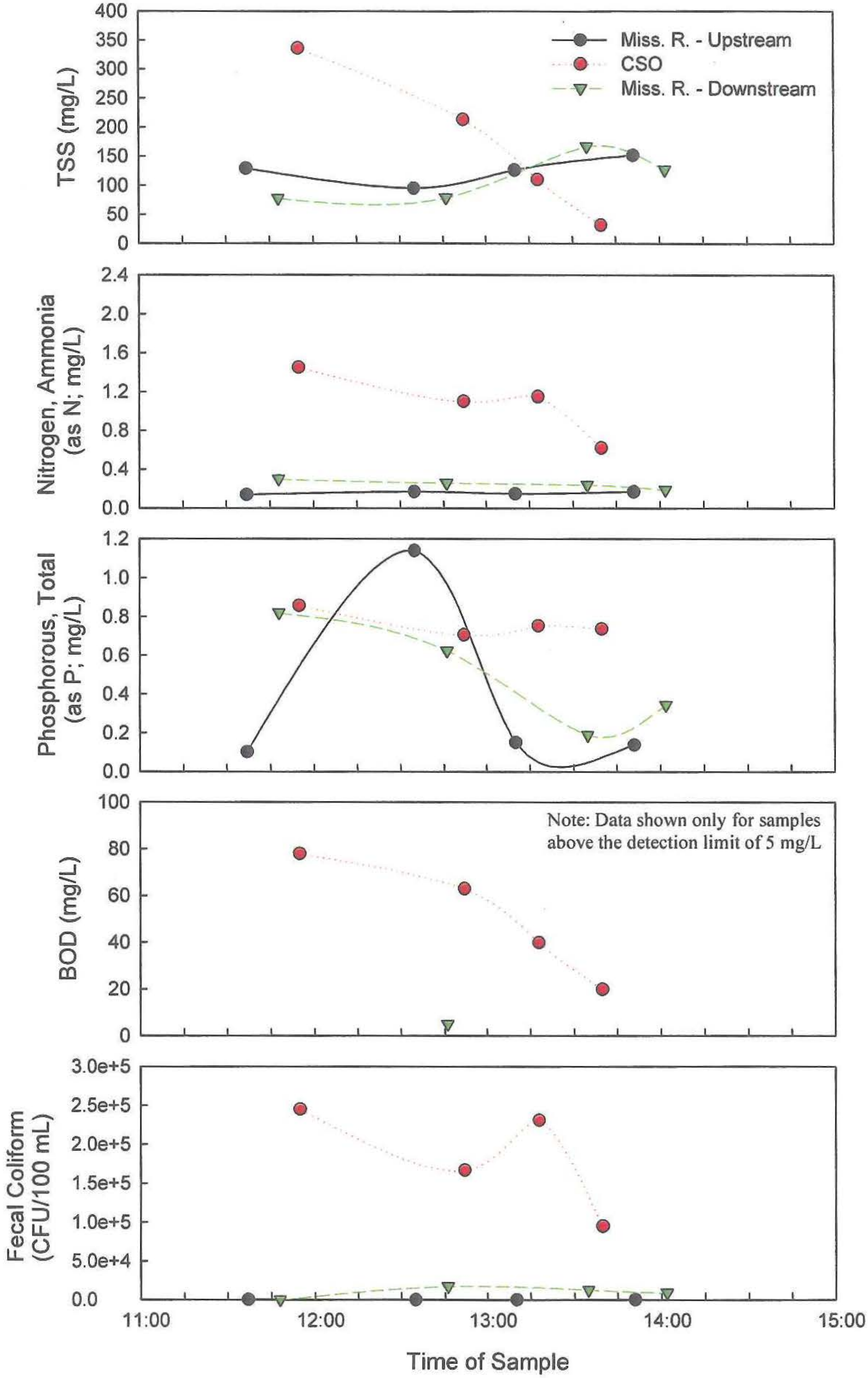


Figure 8 April 3, 2007 CSO Discharge and Mississippi River Monitoring Results (CSO Event)

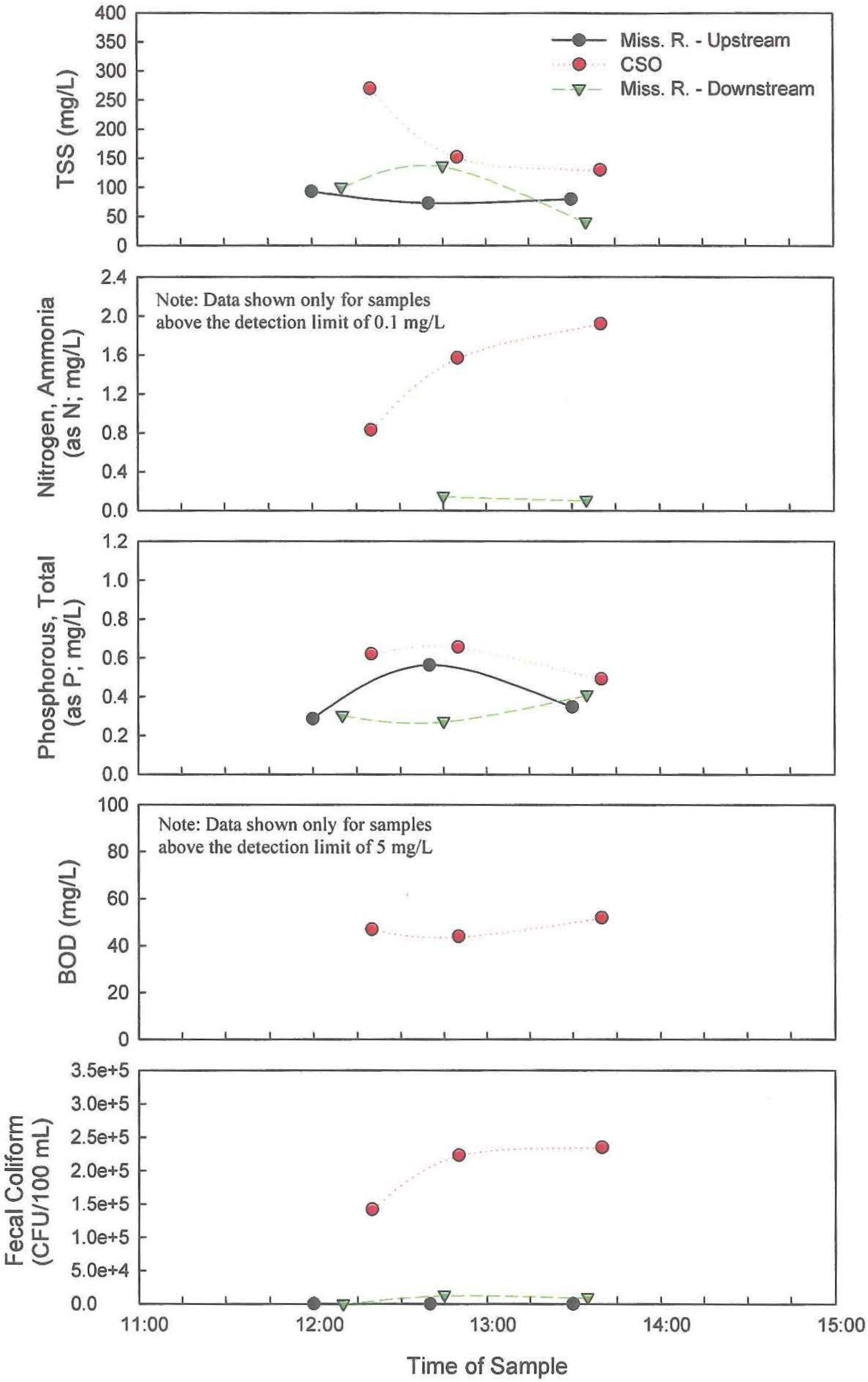


Figure 9 **CSO Discharge and Mississippi River Monitoring Results (CSO Event)**

*********************** **Note: Sampling Event #3 has yet to occur** **********************

The information presented in **Figure 8** for the sampling event on April 3rd, 2007 does not follow any broad trend as expected, and as seen for the first sampling event. The data collected for the CSO discharge during this event shows trends which vary by the pollutant analyzed. TSS concentrations are seen to decrease over time as expected, while nitrogen concentrations and fecal coliform levels increase over time. Phosphorous concentrations, on the other hand, do not show any apparent trend, while BOD concentrations remain generally constant. The trend of nitrogen and fecal coliform to increase in the CSO discharge over time may possibly be due to the use of a grab sample in place of a composite, or the previously discussed factor of proximity of the sampling location to the bank of the river.

Samples taken upstream and downstream of the CSO outfall generally follow the trends seen in the first sampling event, with the exception of two points which seem to be erroneous. The TSS concentration in the second downstream sample is high, while the CSO TSS concentrations are decreasing. The second erroneous data point is the phosphorous level in the second upstream sample, showing a spike in phosphorous levels. Again, the same factor of proximity of the upstream and downstream sampling points to the bank of the Mississippi River may be responsible.

*********************** **Note: Sampling Event #3 has yet to occur** *********************

Obviously, more sampling events would have yielded a more accurate picture of the pollutant levels in CSO discharges from the City of Wood River, and the impacts it has on the Mississippi River. However, the data collected from each CSO event is useful to compare to each other in order to define the range of pollutant levels which may be seen in these discharges, as well as to compare to the pollutant levels found in the river during dry weather and CSO events. All analysis reports and chain of custody information for the wet weather sampling can be found in **Appendix O**.

Metering of CSO discharges was also included in the sampling plan in order to accurately quantify the volume of CSO discharged to the river during each event. A flow meter was purchased and installed as part of this effort; however, unforeseen operation issues prevented the acquisition of flow monitoring data for CSO events during the sampling period. An issue related to the placement of the meter upstream of the flap gate on the 84" sewer as it enters the Levee District Pump Station forebay created high turbulence in the vicinity of the flow meter while the gate was in use during high river levels (which persisted over the entire sampling period). This issue is currently being reviewed, and resolution of this issue will be a priority in the implementation of the final recommendations of this LTCP.

C. Monitoring Data Summary and Conclusions

Although variations and possible erroneous data points in the sampling results are present, the majority of the data collected is useful in defining the CSO discharge pollutant loads, the baseline pollutant loads of the Mississippi River, and the possible impacts of the CSO discharges on the river. To determine a baseline for pollutant concentrations in the Mississippi River, the sampling data gives a range of values that the pollutants may normally be present at. Upstream of the outfall these ranges are as follows:

	Dry Weather	CSO Events
TSS (mg/L)	60 – 155	73 – 152
Nitrogen, Ammonia (as N; mg/L)	< 0.1 – 0.37	< 0.1 – 0.17
Phosphorous, Total (as P; mg/L)	0.158 – 0.513	0.103 – 1.14
BOD (mg/L)	< 5	< 5
Fecal Coliform (CFU/100 mL)	140 – 810	18 – 400

Downstream of the outfall, pollutant ranges are generally the same, and are as follows:

	Dry Weather	CSO Events
TSS (mg/L)	62 – 449	78 – 167
Nitrogen, Ammonia (as N; mg/L)	< 0.1 – 0.27	< 0.1 – 0.3
Phosphorous, Total (as P; mg/L)	0.169 – 0.522	0.189 – 0.82
BOD (mg/L)	< 5	< 5 – 5
Fecal Coliform (CFU/100 mL)	140 – 390	142 – 17500

Comparing these ranges of pollutant values between dry weather and CSO events for the upstream sampling point, there is no significant differences seen. This implies that any differences seen in the pollutant concentrations in the river between dry weather and CSO events at the downstream sampling point are mainly attributable to the CSO discharge with no major contributions by other point or non-point sources. Comparing the ranges of pollutant values for the downstream sampling point during dry weather and CSO events, it is apparent that the only significant affect of the CSO discharge on the river is the increase in fecal coliform levels, which is the result expected and discussed in detail in Section II of this LTCP. *

To determine a baseline for pollutant concentrations in CSO discharges, a range of values that the pollutants may normally be present at can be obtained from the sampling data. These pollutant ranges for CSO discharges are as follows:

TSS (mg/L)	32 – 336
Nitrogen, Ammonia (as N; mg/L)	0.6 – 1.92
Phosphorous, Total (as P; mg/L)	0.492 – 0.858
BOD (mg/L)	40 – 78
Fecal Coliform (CFU/100 mL)	95000 – 245000

Comparing the ranges of the pollutant concentrations in the CSO discharges against those found in the Mississippi River during dry weather, it is obvious that CSO flows contain significantly more pollutants than that normally found within the Mississippi River, with the exception of the concentration of TSS. However, the high TSS concentration found downstream of the outfall during dry weather may be attributable to the factors discussed previously. Even though the pollutants in the CSO flows are much higher than those normally found in the river, the only significant impact the CSO flows seem to have on the river is the increase in fecal coliform. This is mainly due to the high assimilative capacity of the Mississippi River, and the low volume of CSOs relative to the volume of the river.

END OF SECTION III.

IV. CONSIDERATION OF SENSITIVE AREAS

A. Definition

Several characteristics of the area around a CSO outfall may qualify that area as a "sensitive area", for regulatory purposes. As defined by the USEPA, a sensitive area is an area which is considered to meet one or more of the following criteria:

- designated as an Outstanding National Resource Water
- contains Threatened or Endangered Species or Habitat
- used for Primary Contact Recreation
- located within the protection area for Drinking Water Intake(s)

B. Implications

If a CSO outfall is determined to be located within a "sensitive area", the LTCP for that CSO should consider such outfall(s) to be of highest priority for prohibition of new or significantly increased overflows into the "sensitive area". If possible, both physically and economically, such outfalls should be eliminated or relocated; unless higher levels of environmental damage would occur as compared to the continuation of discharge to the sensitive area with an increase in treatment of the outfall discharges in order to meet water quality standards.

C. Outstanding National Resource Water / Endangered Species Analysis

The Mississippi River is not currently classified by the USEPA or the State of Illinois as an Outstanding National Resource Water. Also, according to the Illinois Department of Natural Resources' Ecological Compliance Assessment Tool accessed on 6/19/2006, the area near the CSO outfall does not contain threatened or endangered species (see **Appendix U** in this LTCP).

D. Primary Contact Recreation Analysis

Although this portion of the Mississippi River is generally only used for barge traffic, the Illinois Pollution Control Board's (IPCB) Water Quality Standard does designate Primary Contact Use in this section of the Mississippi River. However, there are no public beaches in this area, and barge traffic makes direct-contact recreational use of the stretch of the River within the vicinity of the outfall extremely dangerous.

E. Drinking Water Intake Analysis

Although the immediate area around the Wood River CSO outfall does not contain an intake for Public Drinking Water Supply, as previously discussed, AWC's Choteau Island Intake is approximately 6 river miles downstream of the outfall. Thus it is important to determine whether Water Quality Standards for Public Water Supply downstream at the intake are being met, or if CSO discharges are contributing to excursions. As mentioned above, the 2006 Illinois Water Quality Report states that Public Drinking Water Supply Use is impaired due to manganese. 6 miles

It is not thought that Wood River's CSO discharges contribute significantly to this impairment: however, the LTCP must take into account that the limits on fecal coliform at the site of the intake must continue to be met. The IPCB Water Quality Standards for Public Water Supply: Subpart C can be found in Part 302 of the IPCB Regulations (see **Appendix V**, herein). The limits on fecal coliform are defined as "….at no time shall the geometric mean, based on a minimum of five samples taken over not more than a 30 day period, of fecal coliform exceed 2000 per 100 mL."

Fecal coliform data from raw water (Mississippi River) samples at the Choteau Island Intake was obtained from AWC and evaluated to determine water quality between January 2002 and December 2005. This data from AWC's Choteau Island Intake can be found in **Appendix W** of this LTCP. **Table 15** shows the geometric mean of fecal coliform results for each month between 2002 and 2005; and the shaded areas in **Table 15** indicate exceedances of Illinois Pollution Control Board Regulations Part 302, Public Water Quality Standard: Subpart C.

Although the 2006 Water Quality Report by the Illinois Pollution Control Board does not list this area of the Mississippi River as impaired by fecal coliform for Public Water Supply Use, **Table 15** shows relatively minor exceedances of the standard seven times over the last four years, including twice in 2005. These exceedances are seen to be occurring mainly in the winter months when upstream sources such as wastewater treatment plants may not be required to disinfect their effluent. Spreadsheet calculations supporting these findings can be found in **Appendix W** of this LTCP.

In light of this finding, it appears that the Wood River CSO outfall does, in fact, discharge to a "sensitive area". However, as previously discussed, other sources of fecal coliform very likely contribute significantly to the observed excursions; they cannot solely be due to the Wood River CSO.

Table 14 – Choteau Island Raw Water Intake Annual Fecal Coliform Data

	2002	2003	2004	2005
January	1406	970	1265	2357
Febreuary	2004	791	2684	2077
March	2515	1001	1246	414
April	1778	1467	874	401
May	2799	1738	1297	227
June	1571	1242	1055	371
July		720	837	305
August	675	422	1282	299
Sept.	617	974	366	458
Oct	1079	463	766	309
November	833	1686	1923	970
December	1084	1518	2160	548

*Note: Shaded areas show values which exceed Illinois Pollution Control Board Regulations Part 302, Public Water Supply Use.

F. Economic and Technical Feasibility of Eliminating Existing Outfall

Due to the fact that the Wood River CSO outfall has been determined to discharge to a "sensitive area", the economic and technical feasibility of either eliminating or relocating this outfall needs to be considered.

Since the City of Wood River has only a single outfall point for its wastewater discharge into the Mississippi River, which also acts as the sole CSO outfall point, the elimination of this CSO outfall is totally impractical. However, the option of "eliminating" the adverse environmental impact resulting from this lone CSO outfall might be feasible, and thus needs to be considered.

Total separation of the sanitary and storm water systems would be the only way to ensure that the discharge from this outfall during wet weather events would not have any significant adverse environmental impact. It is estimated, though, that such a project would require $50 million in construction costs to implement, as described for <u>Option I.D. – Total Separation of Sanitary and Storm Sewers</u> in Section V. of this LTCP.

Adding the cost of this total sewer separation project to the City's financial capability analysis (which is discussed in Section IX. of this LTCP), would create a situation which represents a "medium" financial burden on the City (based on a Residential Indicator of 2.03% and Financial Capability Indicator of "Strong" - see **<u>Appendix CC</u>**, herein). However, there are other factors relating to the City's financial situation, which must be considered when determining the actual financial impact of a project of this magnitude. These factors include the actual property tax rate for Wood River residents, and the possible elimination or renegotiation of wastewater system funding from BP Amoco. These related issues, which are discussed in more detail in Section IX. D. of this LTCP, reveal that a project requiring this much initial capital cost investment would be economically debilitating to the City of Wood River.

In addition, the relocation of this outfall is not believed to be technically feasible, due to a number of considerations. The first of these factors is that there are no other water bodies in close proximity to which the Wood River WWTP could discharge which are not ultimately tributary to the Mississippi River. Thus, relocation of this outfall to a different receiving water body would not result in lessening the potential effects of the CSO on the Mississippi River. In fact, relocation might actually prove more harmful to a smaller receiving water body than such discharges are currently to the Mississippi River, which has a very high natural assimilative capacity.

Another possible means of relocation would be to move the outfall to a point downstream of the AWC Choteau Island Raw Water Intake. This would require major construction costs, but is most likely technically infeasible, in and of itself; due to the 6 mile distance that the outfall pipe would need to be extended through developed property. However, even if this were accomplished, there are other water treatment plant intakes downstream of the Choteau Island Intake, which feeds the St. Louis City Water Division Chain of Rocks WTP. Consequently, relocation would not result in lessening the effects of the CSO on water treatment plant raw water sources in this reach of the Mississippi River.

G. Summary of Sensitive Area Concerns

Since no other CSO outfalls exist within the jurisdiction of the City of Wood River, it is obvious that this outfall <u>must</u> have the highest priority in the development of CSO LTCP control alternatives, as required by Federal CSO Control Policy for outfalls which impact environmentally-sensitive areas. However, as shown above, it is simply not economically feasible or technically practical to relocate or eliminate Wood River's lone CSO outfall. Therefore, it will be the intent of this CSO LTCP that any significant increases in flows to this outfall will be prohibited, and that means to increase treatment (either capacity or capability) will be executed (if found to be appropriate following thorough analysis of all identified CSO control alternatives), in order to meet Water Quality Standards.

END OF SECTION IV.

status: "not economically feasible"

V. SCREENING / RANKING / ANALYSIS OF CSO CONTROL ALTERNATIVES

A total of nine different basic types of CSO control alternatives were initially identified as being worthy of consideration for use in long term CSO control planning for the City of Wood River. These nine basic types of alternatives were then further broken down into sub-alternatives, which resulted in a total of nineteen separate sub-alternatives (options) being deemed potentially worthy for preliminary screening and evaluation. As recommended by USEPA guidance, these alternatives were drawn from the four general categories of CSO control alternatives recommended by USEPA – source controls, collection system controls, storage, and treatment technologies.

9 / 19

In this Chapter of Wood River's CSO Long Term Control Plan, these nineteen options are described briefly; and then estimated costs, projected ultimate reductions in CSO flows and/or pollutants, and any known site constraints for each option are presented. It was determined that the evaluation of CSO control alternatives, in terms of suitability for inclusion in the CSO Long Term Control Plan for the City of Wood River, could most efficiently be performed in two distinct stages:

> **<u>Stage 1</u>**: a concept-level determination of the manner in which each option could be applied to Wood River's combined sewer collection / treatment system, followed by the application of a preliminary alternatives "screening" process to each option. The purpose of this initial screening stage being to ascertain if one or more of the nineteen identified options might prove to be so clearly unworthy of inclusion in Wood River's CSO LTCP, so that such option(s) could justifiably be eliminated from further consideration.

> **<u>Stage 2</u>**: a more in-depth, but still, preliminary analysis (evaluation) was then applied only to those options which "survived" the Stage 1 screening process. The purpose of this preliminary analysis (evaluation) was to confirm (or deny) the practical, cost-effective feasibility of actually implementing any given option for inclusion as a part of the CSO LTCP for the City of Wood River. The intent was that, subsequently, some limited engineering design would be performed on the "surviving" (selected) Options, in order to more accurately evaluate the feasibility and cost of implementing each selected Option.

Basically, this Section of the CSO LTCP describes how the nineteen identified CSO control alternatives (Options) were first screened as to their suitability for inclusion in Wood River's LTCP (to eliminate certain obviously unsuitable options from further evaluation); then, those options which were deemed suitable by the screening process (or those which "survived") were then further analyzed (technically and financially) for suitability to Wood River's situation.

It should be noted that the evaluations of alternatives performed as part of the development of this Long Term Control Plan (LTCP) were completed based on the premise that future compliance by the City of Wood River with the LTCP ultimately approved by USEPA would be judged using the **"presumption" approach** – meaning that the City of Wood River would be permitted to have up to four CSO discharges occur annually.

A. Stage 1 – Screening / Ranking of Identified Alternatives (Options)

Alternative I. – Wood River Sanitary / Storm Sewer Separation

Separation of stormwater inlets from the existing combined sewers would decrease the amount of stormwater entering the sewer system, thus reducing the combined wastewater flows that can cause overflows or discharges to the Mississippi River.

A few areas within the City of Wood River had previously been identified by City staff as areas that would benefit from, or that appear to be suitable candidates for, stormwater inlet separation from the combined sewer system. These known areas were evaluated, along with other possible locations; as well as was a total city-wide separation of sanitary and storm sewers.

Option I.A. – Madison Avenue Area Sewer Separation

An existing stormwater conveyance ditch exists near the intersection of St. Louis Road and Madison Avenue (also known as IL Rt. 143). This ditch had previously been used for conveying and, at times, temporarily storing stormwater runoff from St. Louis Road; however, a project to divert this stormwater to Helmkamp Lake has recently been completed. This conveyance ditch is now available for conveying / storing stormwater runoff from between 60 to 80 inlets currently tied to the combined sewer system along Madison Avenue. A rough cost estimate for this project to intercept and divert the stormwater collected by these inlets was prepared, for screening / ranking purposes, of between $500,000 and $800,000; based on actual costs for similar projects undertaken by the City recently.

The potential capacity of this existing ditch to accept additional stormwater conveyance / storage was not determined at this early stage of project development. Detailed hydraulic evaluations would need to be completed before an accurate estimate of ditch capacity could be made. Detailed analysis of the amount of stormwater entering each inlet on Madison Avenue for several design storms would also need to be completed, before the number of inlets which could safely be diverted (and a more accurate estimate of these associated costs) can be determined. **Further evaluation of this Option I.A. will be completed in the Stage 2 evaluation of CSO control alternatives.**

Option I.B. – Central and Hawthorne Sewer Separation

This area, in the southeast portion of the City, reportedly has been the site of inadequate-drainage-related flooding problems in the past. The area consists of an approximate 13 block section of the City of Wood River, located mainly on City Sewer Map Sections 1 and 3. The topography of this area is very flat; and stormwater runoff generally flows toward a natural depression in the area's center, near the intersection of Central and Hawthorne Avenues.

An engineering and economic study of the flooding problems in this area was conducted for the City of Wood River in 2002 by Horner & Shifrin (included herein as **<u>Appendix R</u>**); for the purpose of assisting the City in applying for an Illinois Department of Natural Resources grant for stormwater system improvements. One of the alternatives evaluated in that 2002 study was the construction of a stormwater sewer, through the BP Amoco property, for gravity discharge of stormwater directly to the Mississippi River. This alignment would include 5,400 feet of storm sewer located on BP Amoco property, and 4,130 feet of storm sewer located on fully-developed residential property – for a total of 9,700 feet of storm sewer.

The total estimated cost for this Central and Hawthorne sewer separation project is approximately $13 million. This relatively high cost is due to the large size of the pipe needed to convey peak stormwater flow rates to the River (108" diameter), the flat terrain in which the area is located (which causes deep excavations to sustain gravity flow for 9,700 ft), and the need for removal and replacement of 2,100 linear feet of roadways. This storm sewer was designed to handle the peak stormwater flow rate determined by the previously-mentioned 2002 stormwater study, using a HEC1 hydraulic modeling program during a 5-year storm event. In addition to the costs reported above, major utility relocation would also need to be completed, at substantial cost.

Using the Rational Method, a runoff factor of 0.5 (for single family residential), and the same rainfall intensity used in Section II. of this LTCP (an 0.81 in/hr rainfall intensity for a one hour event), the reduction in the amount of CSO discharge resulting from this project was determined to be approximately 6 million gallons -- meaning that there is sufficient potential benefit to be gained from a sewer separation project in this area to warrant further consideration, but <u>only</u> if a lower cost approach can be identified.

One possible means of implementing Option 1.B. with a lower capital (construction cost) investment would be to employ a pump station and force main for a portion of the overall route to the River. This approach could greatly reduce the cost associated with installing a large-diameter, deep gravity sewer all the way to the River. However, one significant "downside" of this approach would be the substantial additional capital cost to construct a rather large-capacity pump station, as well as the recurring O&M costs to operate that pump station of the next 40+ years.

Further evaluation of this <u>Option I.B.</u>, primarily in terms of different methods to separate some of the stormwater from the Central and Hawthorne area from the combined sewer system, <u>or</u> to temporarily store wet weather combined wastewater flow, will be completed in Stage 2 of this evaluation of CSO control alternatives.

Option I.C. – Other Possible Sanitary / Storm Sewer Separation Locations

This CSO control Option would involve a multi-part approach; wherein the City would first identify specific areas of the City's existing combined sewer system where inordinately high volumes of stormwater appear to be entering the combined sewers; implement a plan to separate the sanitary wastewater from the combined sewer flow by constructing new separate storm sewers; and also provide stormwater retention basins in those sewer separation areas, to temporarily store peak stormwater flows.

Such a multi-part strategy would be needed because of the relatively high peak-to-average flow ratios which have been observed in the City's combined sewer system during wet weather events, which are the root cause of CSO occurrences.

Simply removing the sanitary wastewater volume from the combined sewer (by constructing new, separate sewers to convey just the sanitary flow) would not, in and of itself, be sufficient to eliminate CSO occurrences. The temporary stormwater retention basins would be necessary to effectively "shave off" the peak stormwater flow from the combined sewer, store that shaved off peak volume until the wet weather event causing the peak stormwater flow has ended, and then the temporarily stored stormwater could be gradually fed back into the sewer system.

The City of Wood River is relatively densely populated within the City Limits. The only locations in which temporary stormwater detention basins could feasibly be constructed, without necessitating the buy-out of an inordinate number of homes, would be either in existing conservation/recreational areas, or on vacant land obtained from BP Amoco.

Considering that public perception on replacing any conservation / recreation area with a stormwater detention basin would be highly negative, this does not seem to be a viable option. Placement of a detention basin on unused real estate belonging to BP Amoco, although located where high stormwater run-off occurs, is also not realistic due to PCB contamination of the entire site. The legal issues involved in the sale of such property and the incurred potential liability risk to the City would not be justifiable in this case, as the risk to benefit ratio is too high.

Considering all of the significant negative concerns related to this Option (as described above), Option I.C. was judged not to be worthy of further evaluation for possible inclusion in the CSO LTCP for the City of Wood River.

Option I.D. – Total Separation of Sanitary and Storm Sewers

A total separation of sanitary and storm sewers was previously evaluated in the 1981 CSO study conducted by Sheppard, Morgan, and Schwaab, Inc. for the City of Wood River. This study found that implementing this option could result in the elimination of 252 MG of CSO flows into the Mississippi River, but at an inflation-adjusted cost of more than $50 million. **Due to the extremely high cost and lengthy implementation period for this Option, it was determined that Option I.D. should not be further evaluated for possible inclusion in Wood River's CSO LTCP.**

$50 M

Alternative (Option) II.A. – Wood River Sewer/M.H. Rehabilitation for I&I Reduction

The most recent infiltration and inflow study conducted for the City of Wood River was included as part of the previously mentioned 1981 CSO study completed by Sheppard, Morgan, and Schwaab, Inc. The results of this I&I study revealed that, at the time, there were no significant sources of infiltration and inflow. Since that study was conducted, the City has properly maintained their sewer system and manholes, but has not done any major repairs on a system-wide basis.

However, it is assumed that rehabilitation of the City's sewer system to decrease I&I, especially in combined areas, would not result in any appreciable, cost effective decrease in CSO flows. It would be necessary to perform another I&I study, in order to accurately determine the reduction of I&I that could now be accomplished through sewer / manhole rehabilitation, as well as the associated costs.

The estimated cost of sewer inspections and smoke testing for 30% of the City's sewers, as well as limited dye testing and flow monitoring, is estimated to cost approximately $255,000. The City's sewer system operations / maintenance staff has been relatively diligent, during the 20 + years since the last I/I study was performed, in finding / eliminating major sources of I/I that they discover in the City's sewer system.

For this reason, City staff are confident that any major, system-wide effort to eliminate I/I from the City's sewer system would not produce a reduction in extraneous flows (I/I) entering the City's sewer system sufficient enough to justify the relatively high cost of such an effort. **Therefore, I/I reduction (through sewer / manhole rehabilitation – Option II.A. was not included for further analysis in the City's CSO Long Term Control Plan.**

Alternative III. – Peak Flow Attenuation by Temporary In-Line Storage

Increasing the temporary in-line storage capacity of the existing sewer system would allow for more CSO flows to be captured for treatment at the City's existing wastewater treatment plant. Two types of in-line storage options were evaluated for possible inclusion in this LTCP. It should be noted that estimates of O&M costs for these Options do not include costs associated with the treatment of an additional volume of wastewater at the wastewater treatment plant; which could be substantial, but would be essentially the same for all Options.

Option III.A. – Inflatable Dam Placement

Inflatable dams could be placed within the existing combined sewer system to act as regulators to suspend or re-direct combined sewer flows so as to maximize storage capacity within the sewer system. Inflatable dams generally are commercially-available for sewers 48" diameter or larger. A 48" diameter inflatable dam system (including the dam, PLC, control panel, blowers, and valves) for Wood River is estimated to have a purchase cost of approximately $205,000. This estimate does not include any excavation, backfill, or installation costs. Additional operating and maintenance costs are considered negligible. The amount of wet-weather combined wastewater flow which could be either re-directed or retained for later treatment at the wastewater treatment plant, would depend on where the dam was placed. Placement locations / elevations for any inflatable dams in the combined sewer system would need to be VERY carefully evaluated, in order to minimize the risk of creating basement backups and/or surface flooding, due to the retention of higher volumes of stormwater within the sewer system.

Due to the significant concerns expressed by City staff regarding the practical applicability of, and additional property damage risk associated with, including this Option in Wood River's CSO Long Term Control Plan, it was determined that Option III.A. was not worthy of further evaluation for possible inclusion in this LTCP.

Option III.B. – Pump Station Operational Modifications

Modifications to the existing pump stations (possibly involving expansion of the existing wet-wells, and/or changes to pump operating levels, and/or other modifications to operating scenarios) could be used to allow for more flow to be stored within the wet-wells for eventual conveyance to the wastewater treatment plant. While changes to pump operating levels may only slightly reduce CSO overflows, increasing the physical size of the wet-well could have a more significant impact; but at much higher capital cost.

Careful analysis of sewer system hydraulics would need to be completed to prevent basement backups and surface flooding due to pump station modifications. Costs for modifying pump operating levels would be negligible, and no significant changes in O&M would result. Costs for increasing the physical size of wet-wells would depend on available space constraints at the pump station site, and the added capacity desired.

Modifications of this nature could cost between $50,000 to $150,000 per wet-well. O&M costs would not increase appreciably. The reduction in CSO flows, expected to result from such pump station modifications, could range from 0.1 mgd to 0.6 mgd, depending on the increase in wet-well volume.

Another means for operationally modifying pump stations, in order to reduce CSO overflows, would be to replace existing undersized (for peak wet weather conditions) capacity pumps with pumps having greater discharge capacities and/or discharge head capabilities. In many instances, implementing this option would mean that the wet well size would also have to be increased, in order to prevent damaging short-cycling of the new pumps.

In addition, unlike the situation with just changing pump operating levels and/or increasing the wet-well size (wherein the flow rate to the treatment plant is not increased, since only the time needed to convey the flow to the plant is lengthened), this Option would necessitate modifying the wastewater treatment plant so it could accept the higher wastewater flow rate.

Given the significant capital costs involved in the multitude of actions involved with implementing this Option -- purchasing / installing higher capacity pumps, increasing wet well (and quite possibly dry well) size, and increasing the wet weather capacity of the existing treatment plant -- this <u>Option III.B.</u> does <u>not</u> appear worthy of further consideration to be a part of Wood River's CSO LTCP.

<u>Alternative IV.</u> – Peak Flow Attenuation by Temporary Off-Line Storage

Three options for temporary off-line storage of Wood River's combined wastewater which would capture more flow for treatment were evaluated for possible inclusion in the LTCP, as outlined below. The estimates of cost presented for these three options do <u>not</u> include the costs associated with the resulting treatment of higher volumes of wastewater at the City's WWTP, since such costs would be incremental.

<u>Option IV. A. – Use BP Amoco Riverfront Ponds for Temporary Storage</u>

Amoco => 166 MG

Earthen-bermed ponds presently located on BP Amoco's riverfront property near the City's WWTP, and which are used by BP Amoco to store wastewater and stormwater runoff generated by BP Amoco facilities, reportedly have a combined capacity of 166 million gallons (MG). Stored BP Amoco wastewater is then subsequently conveyed to the Wood River Wastewater Treatment Plant by pumps, for treatment and eventual discharge as part of the City's WWTP effluent. Refer to **Figure 10** on the following page for location and size of these storage ponds, and their spatial relationship to the City's WWTP.

A study was conducted in 1993 by Sheppard, Morgan, & Schwaab for the City of Wood River, in response to a 1987 IPCB order, which evaluated using these BP Amoco ponds for potential use to temporarily store Wood River's combined wastewater (See **<u>Appendix P</u>**). That 1993 study analyzed a series of eight possible operating scenarios for Wood River's use of the BP storage ponds; and concluded that capacity for possible storage of Wood River combined wastewater in the BP Amoco storage ponds could generally be made available within a range of 117 to 140 MG.

No Scale
84" Sewer
DIVERSION BOX
U-100 P.S.
Temp. Surge Basin
Landfill (formerly Pond #1)
IL Rte. 3
CLOSED DISPOSAL FACILITY
Pond 2A
Pond 3A
MISSISSIPPI RIVER
Outfall
SURGE POND
℄ Area-Wide Flood Protection Levee
Landfill
℄ Flood Protection Levee - Top El. 440
℄ Flood Protection Levee - Top El. 427

FIGURE 10

However, during the annual one-month-long period during which the Wood River WWTP uses BP Amoco's storage ponds for temporary storage of Wood River wastewater during WWTP maintenance shut-downs, or during other emergency situations at the Wood River WWTP which might take the WWTP out of service for an extended period, the volume "available" for combined sewage storage would be substantially reduced.

Cost estimates from the 1993 study, inflation-adjusted to present day costs, are $3.0 million for construction of interception facilities, and approximately $640,000 a year in increased operational and maintenance costs. It should be noted that these cost estimates do not include costs to procure access and usage rights for the lagoons from BP Amoco.

Any serious evaluation of this Option for possible inclusion in the CSO LTCP for Wood River, had to be deferred until substantive discussions could be held between the City of Wood River staff and BP Amoco personnel; in order to determine BP Amoco's willingness to allow Wood River to use BP Amoco's storage lagoons or other facilities for temporary storage of excess wet weather flows as a means of CSO control. City staff attempted, for several months, to arrange such a meeting; however, the relationship between the City and BP Amoco is politically sensitive, BP Amoco personnel responsible for their Wood River facilities have responsibility for many other BP Amoco facilities, and BP Amoco was reportedly in the midst of some management changes at their Wood River facility at that time; all of which served to delay this meeting.

Finally, on March 21, 2007 a meeting was arranged and conducted involving representatives of BP Amoco, personnel with BP Amoco's consultant (URS Corporation), the City of Wood River staff, and the City's consultant (Horner & Shifrin). The purpose of this meeting was to discuss BP Amoco's combined wastewater collection and disposal methods (both present and future); the City of Wood River's combined wastewater collection, treatment and disposal methods (both present and future); and (most importantly) the means by which both BP Amoco and the City of Wood River could use the BP Amoco storage ponds for temporary storage of excess combined wastewater flows during wet weather events (both present and future).

March 21, 2007

This March 21, 2007 meeting (which lasted for approximately 3 hours) turned out to be very productive and useful – both for the City of Wood River and BP Amoco. All parties gained a significantly increased level of understanding of both the City's and BP Amoco's combined wastewater control systems. In addition, the BP Amoco representatives were very supportive of the concept of the City of Wood River's future use of BP Amoco's storage ponds for temporary storage of significant quantities of Wood River's combined wastewater during wet weather events.

However, all parties agreed that there was still a great deal of work to be done, in order to accurately determine answers to the following major questions (as well as several minor questions that also need to be answered) regarding the City's temporary storage of combined wastewater in BP Amoco's existing riverfront storage ponds:

- the volume of wastewater which BP Amoco could "safely" allow the City to temporarily store in BP Amoco's storage ponds.
- exactly how the City's "excess" combined wastewater flow could efficiently be diverted to temporary storage in BP Amoco's storage ponds.
- exactly how the City's "excess" combined wastewater flow which was diverted to temporary storage in BP Amoco's storage ponds, could efficiently be returned back to the City's WWTP for treatment/disposal.
- exactly how the City and BP Amoco could handle the possibility that more than one wet weather event which occasions the City's need to temporarily store "excess" volumes of combined wastewater occurs PRIOR to the time when the City has been able to fully return the "excess" flow from an earlier wet weather event (which was temporarily stored in BP Amoco's storage ponds) back to the City's WWTP for treatment and disposal.

Consequently, this meeting ended with the formulation of action plan wherein the two consultants (Horner & Shifrin and URS) were tasked with determining the answers to the several questions which were raised during the meeting, as quickly as possible; then disseminating those answers to all of the participants in the March 21 meeting; and then arranging another meeting (by no later than mid-April 2007) for the purpose of trying to develop a preliminary understanding between BP Amoco and the City of Wood River related to the City's use of BP Amoco's storage ponds as part of the City's CSO LTCP.

During the ensuing period, the above-outlined action plan was completed; and another meeting was held involving representatives of BP Amoco, personnel with BP Amoco's consultant (URS Corporation), Wood River WWTP operating staff, and the City's consultant (Horner & Shifrin) on May 3, 2007.

As a result of that May 3 meeting, **it was concluded that the likelihood of a cost-effective, mutually-agreeable means to allow use by the City of Wood River of BP Amoco's existing riverfront storage ponds for temporary storage of Wood River combined wastewater being developed was sufficiently high, to definitely warrant further evaluation of Option IV.A. in Stage 2 of this evaluation of CSO control alternatives.**

Option IV.B. – Construct Wet Weather Flow Storage Tanks / Basins at WWTP

Providing wet weather flow storage at the existing wastewater treatment plant, in either additional tanks or basins which would need to be constructed, could reduce CSO flows significantly, depending on the amount of area available for construction of such facilities.

For example, construction of a 32 ac-ft. (approximately 10 MG) CSO earthen-bermed retention basin at the existing wastewater treatment plant would cost approximately $1.9 million; and construction of a 64 ac-ft. (approximately 20 MG) CSO earthen-bermed retention basin at the existing wastewater treatment plant would cost approximately $3.3 million.

By comparison, construction of a 10 MG capacity concrete storage tank would cost approximately $3 million. More detail on this cost analysis can be found in of this LTCP.

In addition to these costs, modifications to the diversion structure, screening and grit removal facilities, and Main Pump Station would be needed, in order to allow more flow to be diverted to the wastewater treatment plant. Facilities to convey excess flows to temporary storage, facilities to convey stored flows back into the treatment train, and additional controls to drain the storage tanks once flow rates have returned to normal would also need to be considered.

Substantial increases in O&M costs would also result from implementation of this Option, in terms of: higher pumping rates, as well as for maintenance of the storage tank / basin, and related conveyance facilities. These O&M costs would also depend on the amount of storage desired.

Most importantly, though, these basins / tanks would occupy a considerable amount of space within the existing wastewater treatment plant property and/or adjoining properties; significantly decreasing, or even eliminating, any available space for future expansion of the City's WWTP.

land-locked

Given that the City of Wood River will almost certainly be required to expand / upgrade its current wastewater treatment facilities (WWTP) in the foreseeable future and given that the City's existing WWTP is effectively "land-locked" (by the RR tracks to the east, IL Route 3 to the west, an oil storage tank farm to the north, and BP Amoco property to the south (which is possibly environmentally-compromised), it would not be prudent for the City of Wood River to devote whatever space is conceivably available within the current plant's property boundary to CSO detention tanks / basins. For this reason, **Option IV.B. was not chosen for further consideration for possible inclusion if the City's Long Term CSO Control Plan.**

Option IV.C. – Construct Wet Weather Storage Tanks / Basins at Other Locations

Storage tanks / basins placed strategically at locations in the City, excluding the site of the wastewater treatment plant, is another possible Option for providing off-line flow storage to reduce the occurrence of CSO's. Tanks or basins could reduce CSO flows significantly, depending again on the amount of area available for construction. Costs for construction of tanks or basins and O&M costs would be essentially the same as that reported in Option IV.B., with the exception of increasing pump station capacity. However, substantial additional cost should be added for acquiring a significant amount of land.

As previously indicated, due to the unavailability of any parcels of land within the City limits large enough to accommodate the relatively large-volume retention basins needed, this would be a VERY difficult Option to implement for Wood River. More to the point, Wood River residents would almost certainly be adamantly opposed to the concept of having such combined wastewater storage facilities located "in their backyards".

Open-top storage basins would result in odors, noise, mosquito control, and many other esthetic and/or public health problems – not to mention the serious safety risk which open-top basins (even when properly fenced) would pose to children in the area. For this, and other reasons, the zoning / building codes in Wood River would not allow the construction of such basins without covers. However, constructing tops over such storage basins occupying relatively large areas would be prohibitively expensive; and would dramatically increase the maintenance labor, as well as other resources, needed to clean up the storage basins / tanks following their use.

Another possibility would be to acquire property near the City's current WWTP location and/or the CSO outfall point. In reviewing available maps and property records, there appears to be unoccupied property available within those areas. However, the large majority of that property is owned by BP Amoco and the large majority of that BP Amoco-owned property is possibly environmentally-compromised (and therefore not for sale or lease), <u>except</u> for the existing BP Amoco riverfront storage ponds (the potential use of which by Wood River will be evaluated under Option IV.A. in Stage 2 of this evaluation).

Costs for construction of a new 20 MG storage basin – basically in any location within the City of Wood River except the City's WWTP -- are estimated to be approximately $3.8 million. Also, additional allowances would need to be made for the acquisition costs of a significant amount of land, as well as facilities (pipes, pumps, etc.) to convey combined wastewater from the 84" diameter sewer upstream of the pump station to the new storage basins, and then from the storage basins back to the City's WWTP for subsequent treatment and discharge.

Furthermore, the amount of land owned by BP Amoco along the Mississippi riverfront actually available for use as a CSO storage basin is not exactly known. Discussions with BP Amoco concerning the riverfront property have revealed that much of this area is regulated under Federal hazardous waste regulations (RCRA, Part B), and that the Company will likely never be in a position to sell this land.

Given these considerations, as well as the lack of availability of the large parcels of land needed to accommodate such large new basins / tanks – in locations where the tanks / basins could do the most good – within the City limits, it is clear that **<u>Option IV.C.</u> is <u>not</u> a CSO control alternative which should be considered to be feasible for incorporation into the Long Term CSO Control Plan for the City of Wood River**.

However, despite Option IV.C. being eliminated from further consideration, Wood River's possible use of the existing BP Amoco riverfront storage ponds will be evaluated under Option IV.A. in Stage 2 of this evaluation.

Alternative (Option) V.A. – Divert Peak Flows to Store / Treat / Dispose Facilities

The concept of providing new facilities to store, treat, and dispose of an additional 10 times the average dry weather flow, or 25 mgd, was also analyzed in the 1981 CSO study by Sheppard, Morgan, and Schwaab, Inc. for the City of Wood River. This Option would have supplemented the additional capacity to treat wet weather flow available at the WWTP, creating a combined total wet weather flow capacity of 12.5 times the average dry weather flow.

It was estimated in that 1981 study that constructing additional treatment capacity for 25 mgd would decrease CSO overflow events by 55 per year and reduce CSO discharges to the Mississippi River by approximately 135 MG per year. The estimated cost of that project, inflation-adjusted to present day costs, is approximately $4.9 million. Associated additional O&M costs were not presented in that report, but these would obviously be significant.

A substantial extent of additional evaluation would be necessary, in order to determine the practical feasibility of implementing this Option as part of the City's Long Term CSO Control Plan. City personnel have expressed the concern (which is shared by Horner & Shifrin staff) that the inflation-adjusted estimated cost (from the 1981 CSO Study) of $4.9 million to design and construct new facilities at the site of the City's existing WWTP to store, treat, and disposed of an additional 25 mgd of wastewater during wet weather events is far too low (perhaps by a factor of 2 or 3 times). Given the more likely $10 to $15 million implementation cost for this Option, it does not seem to be economically justifiable.

In addition, the lack of space for construction of these wet weather flow treatment facilities on the WWTP site is also of concern. At this time, less than one acre is currently available for use in future expansions and/or upgrades of the City's WWTP; and, as discussed previously in the analysis of Option IV.B. – Offline Storage Tanks / Basins at the WWTP, usage of this area now might be problematic.

The City of Wood River will almost certainly be required to expand / upgrade its current wastewater treatment facilities (WWTP) in the foreseeable future and the City's existing WWTP is effectively "land-locked" (by the RR tracks to the east, IL Route 3 to the west, an oil storage tank farm to the north, and BP Amoco property to the south which is possibly environmentally-compromised).

Therefore, it would not be prudent for the City of Wood River to devote whatever space is conceivably available within the current plant's property boundary to CSO treatment facilities. For this reason, **Option V.A. was eliminated from further consideration for the City's CSO LTCP.**

Alternative (Option) VI.A. – **Install Sewers to Capture More Flow for Treatment**

Installation of parallel relief sewers in certain segments of the City's sewer system which have been identified as carrying high volumes of combined wastewater flow during wet weather could create increased conveyance and storage capacity within the sewer system. Additional volumes of wastewater could also be temporarily stored in new relief sewers, if used in combination with an inflatable dam or other type of diversion structure.

For example, installation of 1,500 feet of 48" relief sewer would potentially result in a maximum of 141,000 gallons of added storage capacity within the sewer system. Of course, even greater volumes of wastewater could be either conveyed or temporarily stored, if certain undersized sewers were replaced with new, substantially larger-diameter sewers.

Such a section of large-diameter relief sewer (roughly 1,500 feet in length) is estimated to cost approximately $750,000 to construct (based on open cut trench methods, in existing R.O.W., the use of ductile iron pipe, and several tunneled road crossings). This amount of expenditure to obtain a relatively small volume of flow conveyance / storage capacity (roughly $5,300. per 1,000 gallons) is significantly higher (on a unit cost basis) than would be other CSO control alternatives potentially available to the City of Wood River.

In addition, rather detailed hydraulic investigations would need to be conducted before optimal locations for relief sewers could be chosen, to ensure that such additions to the sewer system would not contribute to upstream flooding. Increases in operating and maintenance costs for the relief sewer would be negligible, but increased costs due to higher volumes of wastewater flow needing to be treated at the wastewater treatment (which could be significant) would need to be taken into consideration.

Given the relatively high implementation cost for this Option, in comparison to the relatively small benefit obtained (in terms of achieved reduction in combined sewer wet weather flow volume), it appears that the relatively low benefit : cost ratio associated with this Option means that Option VI.A. does not warrant further consideration for inclusion in the Long Term CSO Control Plan for Wood River.

Alternative VII. – End-of-Pipe CSO Contaminant Removal Facilities

A CSO overflow is defined by Federal CSO policy as a combined sewage discharge to the environment, occurring as a result of a precipitation event, which does not receive the minimum treatment specified by CSO policy. Minimum treatment, as defined by CSO policy, includes primary clarification, to remove floatable and settleable solids, and disinfection of effluent (if necessary) to meet Water Quality Standards. Primary clarification can be achieved by any combination of treatment technologies that are shown to be equivalent to primary clarification.

It should be noted that the two possible CSO contaminant removal options presented below would not be stand-alone solutions; but rather would function best if used together, or in conjunction with other appropriate alternatives/options. In addition to the need of utilizing the treatment technologies below either together or with other alternatives, the addition or upgrade of existing screening facilities would be necessary.

<u>Option VII.A. – Swirl / Vortex Treatment Technology</u>

So-called swirl concentrators and vortex separators are used to throttle flow and provide for a gross level of solids and floatable removal from combined sewer flows. Swirl / vortex technologies can vary appreciably in the level of solids removal achieved. However, if properly designed, a hydrodynamic separator can achieve the same removal performance as a primary sedimentation tank – but in one fourth of the plan area occupied by clarifiers. In order to predict actual solids removal efficiencies, particle settling velocity distribution should be determined using samples of actual CSO flows. Also, chemicals can be added to enhance solids separation.

Approximate costs for this Option are estimated to be $370,000 for a design peak flow of 2 mgd, or $1.1 million for a design flow of 10 mgd. This estimate includes equipment, excavation, backfill, and installation costs. O&M costs for this type of equipment are generally negligible, unless it is determined that chemical addition is necessary to achieve the required solid removal efficiency.

As discussed above, for Wood River's situation, this technology would seem to only be useful (or needed) in conjunction with a disinfection technology, as described below. **As a stand-alone CSO Control alternative, Option VII.A. was eliminated from further consideration for possible inclusion in this CSO LTCP**; because this technology provides no real benefits for Wood River's CSO LTCP. This is due to the fact that the TSS contaminant load in CSO discharges from Wood River's lone outfall does <u>not</u> pose a risk of adverse water quality impact to the Mississippi River.

<u>Option VII.B. – Additional Disinfection Technology</u>

The most common type of disinfection technology for intermittent application is liquid sodium hypochlorite addition; but the existing disinfection equipment at the City's WWTP utilizes gaseous chlorine, and is operated year-round.

Upgrades to this system could be accomplished by adding more 150-pound chlorine cylinders, scales, gas feed equipment, and associated controls. However, this would require that disinfection of peak wet-weather flows (following primary sedimentation or its equivalent) occur at or near the existing treatment plant. Increasing the existing chlorine gas disinfection system treatment capacity by 1 mgd is estimated to cost approximately $100,000. Additional O&M costs would mainly be attributable to the usage of chlorine, but maintenance of equipment and electricity would also need to be considered.

Ultraviolet (UV) disinfection, though substantially more costly to purchase and install than chlorine wastewater disinfection systems, is gaining increased acceptance in the municipal wastewater treatment industry – both for continuous wastewater treatment plant effluent disinfection and for intermittent CSO disinfection applications.

This increased use of UV disinfection systems for these purposes is primarily due to the significantly reduced safety risks, and the substantially reduced operational complexity of UV systems, as compared to chlorine or other chemical-based disinfection systems. UV disinfection equipment to treat a 15 mgd flow at the Wood River WWTP is estimated to cost $260,000, with total installation and construction costs of approximately $750,000.

The City of Wood River will almost certainly be required, at some point in the near future, to either substantially modify or replace its current gaseous chlorine wastewater treatment effluent disinfection system (in order to come into compliance with Federal Risk Management Program safety rules for the protection of both the WWTP operating staff and the public located near to the WWTP from public health risks associated with possible chlorine gas releases). Therefore, it would seem that **further evaluation of CSO end-of-pipe contaminant removal (using a combination of swirl / vortex and UV disinfection treatment technologies) would be advisable (designated as Option VII.A.\ B. for further evaluation) in Stage 2.**

<u>Alternative VIII.</u> – Increase Capacity at Wastewater Treatment Plant

Increasing the capacity at the existing wastewater treatment plant would allow for the treatment of a larger volume of combined sewage flow; so three means of creating added capacity at the City's existing wastewater treatment plant were examined. In each case, the cost estimates presented do <u>not</u> include any related necessary modifications to the diversion structure, screening and grit removal facilities, and Main Pump Station to allow more flow to be diverted to the wastewater treatment plant. This is because such costs would be expected to be nearly identical for all three means, making such costs "neutral" for the relative comparison of the three means. O&M cost estimates were also not prepared for these three means (Options), because the increased O&M costs are dependent only on the amount of increase in capacity that is desired.

<u>Option VIII.A. – Modify Existing Equipment to Increase Treatment Capacity</u>

Modification of existing clarifier-tank-internal equipment to improve either primary or secondary treatment, along with an associated IEPA approved re-rating of the wastewater treatment facility, could certainly be used to create more capacity to treat combined sewage flow. However, the amount of increase in treatment capacity needed to be achieved through modifications to existing WWTP equipment (in order to significantly reduce the occurrence of CSO's), and therefore the associated costs, are very difficult to accurately define without performing a thorough analysis of the City's combined sewer system.

It is likely though, since the plant was constructed in 1962 and the last major upgrades to the plant were made in 1993, that an added capacity of 0.3 mgd to 0.6 mgd might be cost-effectively achievable. Since no major new equipment would have to be installed or constructed to implement this scenario, costs for this Option would not be expected to exceed $300,000. In addition, no new treatment tankage or piping would need to be constructed – meaning available space for future WWTP expansion/upgrade is preserved

For these reasons, it would seem that **further evaluation of the Option to modify existing WWTP equipment to create additional wastewater treatment capacity (<u>Option VIII.A.</u>) would be advisable as part of the Stage 2 evaluation of alternatives.**

<u>Option VIII.B. – Expand Primary Treatment Capacity with New Process Units</u>

Expanding the primary treatment capacity of the existing wastewater treatment plant would allow for an additional portion of Wood River's combined sewage flow to receive less-costly-to-provide primary treatment. However, this additional flow would have to be bypassed around the WWTP's secondary treatment facilities because these facilities would not have the necessary hydraulic capacity. Furthermore, in addition to new primary clarification equipment, this Option must also include facilities to effect an increase in disinfection capabilities, as well as additional conveyance systems to transport the higher peak flows around (bypassing) secondary treatment.

As previously indicated, in the discussion of Option VIII.A., the amount of increase in treatment capacity needed to be achieved through expanding the existing WWTP primary treatment facilities (in order to significantly reduce the occurrence of CSO's, and therefore the associated costs) are very difficult to accurately define without performing a thorough analysis of the City's combined sewer system. Since sewer system modeling was beyond the scope of this LTCP, the treatment capacity which is truly needed cannot accurately be determined. As an indication, though, of the cost that could be associated with this Option, primary treatment equipment with a 15 mgd peak capacity alone could cost approximately $5 million to install. Expansion of the existing disinfection system, which was previously discussed under Option VII.B., is estimated to cost an additional $1 million.

In addition, the lack of space for construction of these facilities on the WWTP site is also of concern. As previously mentioned, less than one acre is currently available for use at the WWTP site, and the existing plant is currently in need of expansion. Expansion of the WWTP site is necessary to maintain the 4.8 times dry weather flow capacity of the existing plant.

Therefore, due to the above-described factors, <u>Option VIII.B.</u> was judged to <u>not</u> be worthy of further evaluation for possible inclusion in the CSO LTCP for Wood River.

Option VIII.C. – Interrupt Well Pumping at BP Amoco During Wet Weather

The BP Amoco Pump Station delivers wastewater generated both from intermittently-operating shallow groundwater recovery wells, continuously-operating deep well pumps, and stormwater flows from BP Amoco facilities to the City's WWTP for treatment and discharge. The shallow groundwater recovery well discharge is related to BP Amoco's pump-and-treat groundwater remediation system, which discharges hydrocarbon-contaminated groundwater to the City's WWTP. The continuous deep well pumping is used by BP Amoco to draw down the water table, and create a zone of depression to restrict off-site migration of contaminants.

The wastewater originating from the BP Amoco site is pumped directly into a separate primary treatment train at the City's wastewater treatment plant. Without modifications to the WWTP, reducing (dampening) or interrupting the BP Amoco shallow groundwater well pumping rates during wet weather events would only allow for added capacity in the secondary treatment train, as the municipal wastewater primary treatment train would not be affected.

Theoretically, if modifications to the BP Amoco primary treatment unit and associated infrastructure were made, it is possible that a portion of the peak wet weather flows from the City's combined sewer system (equal to some portion of the revised capacity of the modified primary treatment unit, presumably 3.6 mgd or less) could be treated using the BP Amoco separate primary treatment train (while BP Amoco flows bypassed treatment and were stored in BP Amoco's riverfront storage ponds for later return to the WWTP for treatment and subsequent discharge).

However, not only would modifications to the infrastructure need to be made to allow municipal flows to reach the BP Amoco primary treatment unit, but modifications to the primary treatment equipment itself would be necessary to adequately be able to treat CSO flows. In addition, the diversion structure, screening and grit removal facilities, and Main Pump Station, would also require modifications, to allow more flow to be diverted from the 84" sewer to the City's primary treatment train at the WWTP. Also a PLC-based automated control system would need to be added to ensure that the pumping rate from BP Amoco was decreased in direct proportion to the increased combined sewage flow to the wastewater treatment plant (due to wet weather).

The preliminary cost to construct all of the different elements needed to implement this Option is estimated to be slightly less than $750,000. However, preliminary design of these improvements and necessary controls would have to be completed, before an accurate cost estimate can be made for both construction and increased operation and maintenance.

The City's wastewater treatment plant operators report that BP Amoco's pumping rates to the WWTP are usually at peak levels during, and for sometime after, wet weather events. In analyzing the 2006 BP Amoco pumping rates, the data shown in **Table 15**, below was compiled. This data would seem to indicate that there is only a slight difference between the pumping rates during wet and dry weather conditions, contrary to what the WWTP operators have reported.

Table 15 – BP Amoco 2006 Contribution to Wood River WWTP

Period	Average Daily Flow (MGD)	Peak Daily Flow (MGD)	Peak Pumping Rate (MGD)	Percentage of Days with ADF >or = 3.6 MGD	Number of Days
Wet Weather	1.6	4.48	7.9	5.0%	95
Dry Weather	1.7	4.55	7.7	4.8%	270
Total	1.66	4.55	7.9	4.9%	365

This seeming discrepancy is most likely due primarily to the inability to factor into this analysis the length of time during which pumping rates were increased after a wet weather event, because the wet weather pumping rate data is only compiled for those days on which the rain event occurs. Thus, if pumping rates remain higher over the course of three days after a wet weather event, only the data on the pumping rate for the day of the wet weather event was available to be included in this wet weather data analysis. For those other three days, the progressively decreasing (but still above normal) pumping rates are included in the dry weather data for analysis, if there was no rain event recorded on these days.

Higher BP Amoco pumping rates during, and after wet weather events occur since wet weather run-off from the BP Amoco site is included in the wastewater flows sent to the City's WWTP. Increased flow rates may extend several days after a wet weather event as the wastewater from BP Amoco, which bypassed the WWTP during the wet weather event and was directed to BP Amoco's storage ponds, is pumped back to the WWTP.

During the recent discussions with BP Amoco and the City regarding the City's possible use of BP Amoco's riverfront storage ponds, it was confirmed that BP Amoco is <u>already</u> operating their combined wastewater collection and disposal system in a manner such that a significant amount of BP Amoco's combined wastewater volume that normally flows to the City's WWTP is temporarily diverted to (and stored in) BP Amoco's storage ponds during significant wet weather events.

BP Amoco has employed this temporary flow diversion / storage operating plan for several years, because of their knowledge that the City's WWTP needs most (if not all) of its available capacity during wet weather events – just to handle the combined wastewater flow from the City of Wood River.

The significance of this finding for the City's CSO LTCP is, of course, that **the potential CSO control alternative (option) of requesting BP Amoco to divert / store the combined wastewater from their facilities during wet weather events (which could have been used to reduce the occurrence and/or magnitude of CSO's from the City's combined sewer system) would NOT provide any added benefit for the City's CSO LTCP, because this option is already being practiced (and, thus, is already "factored in" to the City's past CSO history)**.

It was also learned that the City WWTP operators already have, and do utilize, the ability to decrease flows received at the City's WWTP from BP Amoco during wet weather events, sending excess BP Amoco flow to the BP Amoco storage ponds. **Therefore, due to the above-described factors, Option VIII.C. was judged to not be worthy of further evaluation for possible inclusion in the CSO LTCP for Wood River.**

Nevertheless, as the technical details of Option IV.A. are worked out in the Stage 2 evaluation, it is likely that some form of Option VIII.C. (most likely, to temporarily interrupt some well pumping from BP Amoco) will be incorporated into the City's CSO LTCP, as a part of one of the other Options recommended for implementation.

Alternative IX. – Decrease Flows from Villages of Hartford and South Roxana

By requiring flows from the Villages of Hartford and Roxana to be temporarily decreased during wet weather events, more treatment capacity could be made available at the Wood River WWTP for the treatment of wet weather flows from Wood River's combined sewer system. However, two key factors need to be taken into consideration during evaluation of this alternative (option).

The first factor is that, in order to obtain cooperation from the Villages of Hartford and South Roxana, the stipulation to require a decrease in wastewater flows during wet weather from the Villages would need to be incorporated into renewed wastewater treatment contracts with Wood River. *

The second factor is that, if wet weather flows exceed the capacity of the Hartford Pump Station, such excess flows are routed to the City of Hartford's CSO outfall, which discharges to the Mississippi River downstream of the Wood River CSO outfall.

City of Wood River staff have indicated their belief that overflows do not occur within the conveyance systems of South Roxana or Hartford; but, efforts to reduce stormwater flows entering the combined sewer system, would need to include modifications to the operational control of pumps at the Hartford Pump Station, to reduce peak wet-weather pumping by an amount proportional to the estimated wet weather flow reduction achieved by the capital improvements executed. It should also be noted that (in addition to the estimated costs presented for the two Options below) the diversion structure, screening and grit removal facilities, and Main Pump Station would also require modifications to divert more flow to Wood River's WWTP.

<u>Option IX.A. – Require Sewer / Manhole Rehabilitation for I&I Reduction</u>

It is believed that no infiltration and inflow (I/I) studies have been completed for the Villages of Hartford and South Roxana within the last 20 years. It is also unknown how well the sewer systems in these two Villages have been maintained. I/I studies for both Villages would need to be undertaken before an estimate of potential combined sewage flow reduction through sewer and manhole rehabilitation, and the associated costs can be developed.

Since it is the considered opinion of City staff and H&S personnel that any repairs made to the Hartford and/or South Roxana sewer systems to decrease I&I (especially in combined sewer areas) would not result in any appreciable decrease in combined sewage flows and City staff are concerned about the political and legal complications surrounding renegotiation of contracts with the two Villages, **<u>Option IX.A.</u> is <u>not</u> worthy of further evaluation for possible inclusion in Wood River's CSO LTCP.**

<u>Option IX.B. – Require Sanitary / Storm Sewer Separation in Villages</u>

Separation of stormwater inlets from combined sewers decreases the amount of stormwater entering the combined sewer system, thus reducing the flows that are pumped to the City's WWTP, freeing up capacity for larger CSO flows to be treated. It is believed that there are areas within the Villages of Hartford and South Roxana which are more likely to be suitable for construction of stormwater retention basins than most areas in the City of Wood River. This is because the Villages are not as densely populated as the City of Wood River. However, further investigation into the feasibility of this Option needs to be conducted before accurate estimates of potential decreases in combined sewage flows and the associated costs could be determined.

City of Wood River officials contacted the Villages of Harford and South Roxana to discuss these two Options. Discussions with South Roxana staff revealed that the Village's sewer system is not combined; but South Roxana officials believe that there are I&I problems within their system.

Discussions with Hartford staff revealed that 25% of the Village's system is separate (with the remaining 75% being combined). Hartford has been doing Insituform-type sewer lining jobs over the past few years, and Hartford staff reports that they have accomplished a significant reduction in I&I.

Analysis of the Hartford Pump Station's total daily flow records for 2006 and the U.S. Census data from 2000 for the Villages of Hartford and South Roxana, the gallons per capita day were determined for both wet and dry weather flow and are presented in **Table 16** below. As indicated by this Table, daily flow from the Villages of Hartford and South Roxanna to Wood River's WWTP is not significantly increased by wet weather, nor is there any significant increase in the gallons per capita day (GPCD). Maximum flows allowable from these two Villages into the Wood River combined sewer system are limited to a peak pumping rate of 1.4 MGD; however, these flows have historically accounted for less than 1.0 MGD of the total flow into Wood River's WWTP.

Subtracting the average daily flow during dry weather from the Villages from the average daily flow during wet weather reveals that the average reduction in wastewater flow that could be removed from the systems of Hartford and South Roxanna (through either separation or I&I reduction) would be approximately only 0.06 MG per wet weather event.

Given such a small potential benefit, as well as considering the intergovernmental issues in requiring these Villages to make improvements to their (generally already fairly run) system, this is not considered to be a cost effective Option for inclusion in the CSO LTCP for Wood River.

Table 16 – Hartford and Roxanna 2006 Contribution to Wood River WWTP

Period	Average Daily Flow (MGD)	Peak Daily Flow (MGD)	GPCD*
Wet Weather	0.2924	0.8175	186
Dry Weather	0.2354	0.4724	150
Total	0.2504	0.8175	160

* Note: GPCD was determined using population estimates from the year 2000 Census.

Alternatives Screening / Ranking Summary

Based on the above discussions of the apparent advantages and disadvantages, a sense of which of the identified total of nineteen Options are worthy of further evaluation of their suitability for inclusion into Wood River's CSO LTCP, and which are not, begins to emerge. To summarize and quantify the results from the screening analysis of these nineteen Options, a Screening / Ranking Matrix was prepared; patterned after USEPA's Screening and Ranking Guidance Document for CSOs, published in August 1995.

In applying this screening / ranking process to the spectrum of CSO Control Options (alternatives) potentially available to the City of Wood River, the basic premise adhered to was that, as stated in the federal CSO Control Policy, "EPA expects a permittee's Long Term Control Plan to give the highest priority to controlling overflows to sensitive areas."

While in Wood River's particular circumstances (wherein the City has only one CSO outfall), no choices need to be made with respect to giving higher priority to controlling one outfall vs. another outfall; this basic premise still bears consideration regarding which CSO Control Option (alternative) may be potentially more consistently effective than another in protecting sensitive areas.

As shown by this **Alternatives Screening / Ranking Matrix** (presented on the following page), each of the nineteen Options were assigned a numeric value from 1 (worst) to 8 (best) to reflect each Option's "relative standing" with respect to the key evaluation factors (or considerations); such as estimated capital cost, operation cost, reduction of discharge flows and/or contaminants, adverse environmental impacts, operational complexity, reliability, and site (space) constraints.

Similarly, each evaluation consideration (factor) was assigned a "weighting factor" (or significance value) on a scale of 1 (least important) to 10 (most important). Using this information, the Screening / Ranking Matrix was then completed to provide a "quantitative rationale" for narrowing the field of alternatives (Options) described in the preceding discussions, by defining those Options which would be the most desirable based on their relative evaluation point standing.

Based on the results presented in the Screening Analysis Matrix, together with the discussions of each Option previously presented in this Section of the LTCP, **the following Options (from among the nineteen identified Options) were eliminated from further consideration in <u>Stage 2 – Preliminary Analysis of Selected CSO Control Alternatives</u>:**

Option I.C.	Option III.B.	Option VI.A.
Option I.D.	Option IV.B.	Option VIII.B.
Option II.A.	Option IV.C.	Option IX.A.
Option III.A.	Option V.A.	Option IX.B.

City of Wood River, Illinois
CSO Long Term Control Plan Development
Alternatives Screening / Ranking Matrix

		RELATIVE STANDING OF EACH OPTION FOR EACH CONSIDERATION																				
		Alternative I				Alternative II	Alternative III		Alternative IV			Alternative V	Alternative VI	Alternative VII		Alternative VIII			Alternative IX	
		Option I.A.	Option I.B.	Option I.C.	Option I.D.	Option II.A.	Option III.A.	Option III.B.	Option IV.A.	Option IV.B.	Option IV.C.	Option V.A.	Option VI.A.	Option VII.A.	Option VII.B.	Option VIII.A.	Option VIII.B.	Option VIII.C.	Option IX.A.	Option IX.B.
ANALYSIS (EVALUATION) CONSIDERATION	WEIGHTING FACTOR (Relative significance of consideration on a scale of 1 to 10)	Sewer Separation - Madison Ave. (Wood River)	Sewer Separation - Central & Hawthorn (Wood River)	Sewer Separation - Other Locations (Wood River)	City-wide Sewer Separation in Wood River	Wood River Sewer / Manhole Rehabilitation	Placement of Inflatable Dams in Wood River Sewer System	Operational Modifications to Pump Stations (Wood River)	Use BP Amoco Lagoons for Storage of Excess Wood River Flow	Construct Retention Basins at Wood River WWTP	Construct Retention Basins at Other Locations in Wood River	Construct New Facilities in Wood River for Store / Treat / Dispose	Install Relief / Replacement Sewers in Wood River System	Install Swirl Vortex Technology on Wood River CSO Outfall	Use Different Disinfection Technology on Wood River CSO Outfall & WWTP	Modify Existing WWTP Equipment to Increase Capacity	Expand Primary Treatment Capacity at Existing WWTP	Temporarily Reduce Well Pumping at BP Amoco During Wet Weather	Village Sewer / M.H. Rehabilitation	Village Sanitary / Storm Sewer Separation
Lowest Capital Cost *	9	7	6	2	1	3	2	4	5	5	2	1	2	4	7	6	3	9	5	3
Lowest Operating Cost	6	8	7	6	4	3	4	2	2	5	2	1	5	4	6	6	2	9	7	5
Largest Reduction in Discharge Flow / Load	10	3	6	4	9	1	1	2	7	4	7	8	2	7	5	3	5	2	2	3
Few Adverse Other Environmental Impacts (air, noise, etc.)	8	7	6	6	6	4	7	7	5	6	1	4	5	6	9	8	7	1	7	6
Least Operational Complexity	3	9	8	7	5	7	4	6	4	6	2	1	6	5	6	5	6	7	8	7
Highest Overall Reliability	8	8	8	7	7	4	3	4	7	4	6	5	5	5	7	7	6	8	5	7
Few Public Acceptance Issues / Legal Constraints	7	7	8	2	2	8	7	7	5	6	3	4	2	7	7	8	7	2	2	1
Least Site (Available Space) Constraints	5	8	7	5	2	9	8	5	8	4	1	2	3	6	6	9	3	9	7	6
Total Points (= the sum of the weighting factors multiplied by each Option's standing)		377	383	258	266	241	233	248	310	275	188	208	195	312	374	356	275	307	276	249
Ranking (with highest point total resulting in the best ranking, and lowest point total resulting in the worst ranking)		2	1	12	11	15	16	14	6	9	19	17	18	5	3	4	9	7	8	13
		Option I.A.	Option I.B.	Option I.C.	Option I.D.	Option II.A.	Option III.A.	Option III.B.	Option IV.A.	Option IV.B.	Option IV.C.	Option V.A.	Option VI.A.	Option VII.A.	Option VII.B.	Option VIII.A.	Option VIII.B.	Option VIII.C.	Option IX.A.	Option IX.B.

* Capital cost standing based on assumed cost per gallon of liquid treated

Thus, the "surviving" Options (all of which scored Total Points greater than 300) to be considered for further, more detailed preliminary analysis (evaluation) are as indicated below:

Option	Description	Matrix Ranking
I.A.	Wood River Sanitary / Storm Sewer Separation - Madison Avenue Area	2
I.B.	Wood River Sanitary / Storm Sewer Separation - Central & Hawthorne Area	1
IV.A. / VII.C	Peak Flow Attenuation by Temporary Off-Line Storage Use of BP Amoco Riverfront Ponds for Storage Temporary Interruption of BP Amoco Well Pumping	6 7
VII.B. / VII.A.	End-of-Pipe CSO UV Disinfection Treatment End-of-Pipe Swirl / Vortex CSO Treatment	3 5
VIII.A.	Modify Existing WWTP Equipment to Increase Treatment Capacity / Capability	4

B. Stage 2 – Preliminary Evaluation of Selected CSO Control Options

Based on the previously-presented preliminary screening / ranking of the nineteen identified Options (alternatives) for CSO control for possible inclusion in the Long Term CSO Control Plan for Wood River, the above-listed seven of those Options "survived" that screening / ranking process – that is to say that those seven Options were selected as worthy of further evaluation. This evaluation will be more in-depth (technically and financially) than the previous screening evaluation, but should still be considered preliminary.

Based on the outcome of this further evaluation of these seven selected Options, the most attractive Option(s) will then be selected, in order to provide the basis for subsequent evaluation of each for suitability to become part of the final, approved CSO Long Term Control Plan for the City of Wood River.

It should be carefully noted that final decisions, as to which of the seven Options undergoing this Stage 2 preliminary evaluation – or possible combinations of Options – should be included in the City of Wood River's CSO Long Term Control Plan, will <u>not</u> be made until the more detailed evaluation(s) described in Section VIII. of this LTCP document have been completed.

<u>Option I.A. Analysis</u>: Madison Avenue Area Sewer Separation

An existing stormwater diversion ditch exists near the convergence of St. Louis Road and Madison Avenue (also known as IL Rt. 143). This diversion ditch discharges into the Levee District sloughs, and has been used for stormwater diversion from St. Louis road until a recent project re-directed this stormwater to Helmkamp Lake.

An opportunity now exists for disconnecting 60 to 80 inlets currently tied to the combined sewer system along Madison Avenue for re-direction to the available diversion ditch.

Site inspection by Horner & Shifrin staff revealed that Madison Avenue contained approximately 60 inlets between its intersections with Alton – St. Louis Road and 6th Street. These 60 inlets were distributed evenly on both sides of the road.

Due to the relatively flat terrain along this part of the City, only a small portion of the area adjacent to Madison Street, beyond the 82 ft. wide by 5,741 ft. long segment of road, is believed to contribute additional flow to the quantity of stormwater flow from this drainage area The additional contributing area, which is currently being utilized as a parking lot, slopes downward toward Madison Avenue, and adds an additional area of 129,150 sq. ft to the surface area of the road (470,762 sq. ft.) for runoff calculations. Using the Rational Method, with a runoff factor of 0.7 (for business district), and the same design storm rainfall intensity used in Section II. of this LTCP document (0.81 in/hr for a one hour event), the amount of wet weather flow that it is estimated that this project would remove from Wood River's combined sewer system is approximately 0.21 MG.

A cost estimate for this project was developed assuming two 18" sewers running parallel along both sides of Madison Avenue until joining together into a 24" sewer for the remaining 750 feet to empty into the diversion ditch, as shown on **Figure 11** on the following page. Total cost for this project is estimated at approximately $1.7 million. All supporting cost estimates and runoff calculations for this cost estimate can be found in **Appendix Q**, herein.

Minor surface flooding has occurred in this area since the completion of a nearby roadway construction project by the Illinois Department of Transportation (IDOT). City officials have had discussions with IDOT concerning how to correct the problem, and feel there is a high likelihood of IDOT contributing funds to this project if it is undertaken by the City of Wood River. These funds would be in addition to any funds received by the City to help implement their CSO LTCP.

Option I.B. Analysis: Central and Hawthorne Sewer Separation

The area around Central and Hawthorne Avenues, in which inadequate-drainage-related flooding problems have occurred, is approximately a 13 block section of the City, mainly located on Sewer Map Sections 1 and 3. The area is bounded on the north by Lewis Avenue, on the south by Tennyson Avenue, on the east by 9th Street, and on the west by 14th Street. Primarily residential with some commercial property along Central Avenue, approximately 300 buildings are within this planning area.

As previously discussed, an engineering and economic study of the flooding problems in this area was conducted for the City of Wood River in 2002 by Horner & Shifrin, Inc.; for the purpose of assisting the City in applying for an Illinois Department of Natural Resources grant for stormwater system improvements.

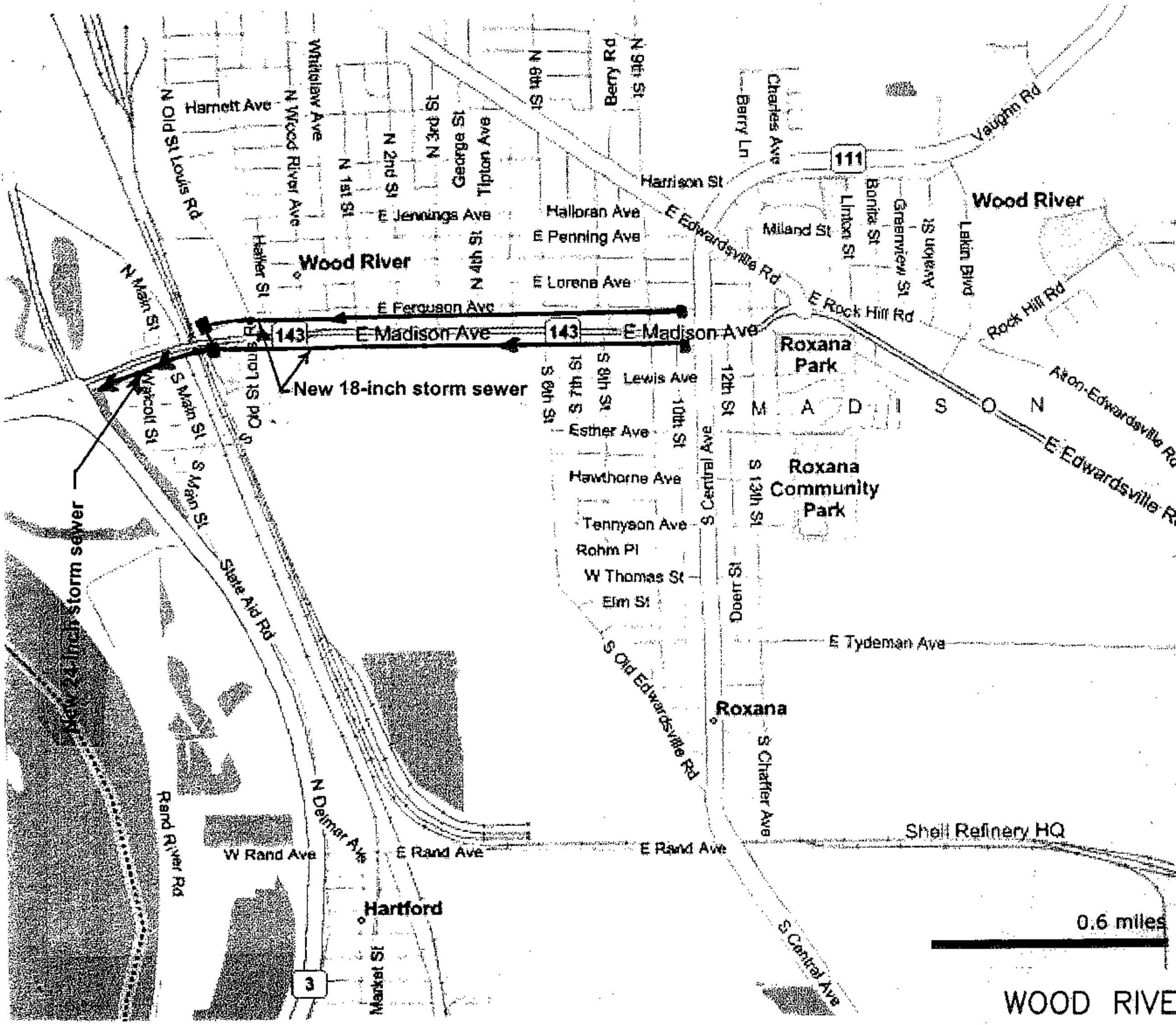


FIGURE 11

WOOD RIVER, ILLINOIS CSO LTCP

MADISON AVE. SEWER SEPARATION PROJECT

HORNER & SHIFRIN, INC.
5200 Oakland Ave. St. Louis, Missouri 63110
640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

This study recommended the construction of a retention basin in this area; however, due to the buyout of homes, the construction of a separate stormwater sewer is more attractive to City leaders. The findings of this report are summarized below, and the original report can be found in it's entirety in **Appendix R** of this LTCP.

The combined sewer system servicing the area includes two main trunk sewers. Runoff from areas along Central Avenue and streets to the west flows north into a 42" diameter sewer running under 10th Street. Runoff from areas east of Central Avenue flows north into a 30" diameter sewer running under 12th street. Inlets are located on most of the street intersections in the study area, and tributary sewers range in size from 8" to 21" in diameter.

Of these two tributary areas, the area to the northwest of the project area has the lesser impact as it contains some stormwater inlets to accept runoff before it reaches the study area. However, because these sewers are a part of the same network of combined sewers as in the study area, the flow taken in at the upstream structures further inhibits the downstream capacity of the pipes. The northwest drainage area covers approximately 0.16 square miles and is entirely developed by single family homes on quarter-acre lots.

The tributary area to the southeast of the study area has a more significant effect. Although some of this area is undeveloped or park land, and thus produces less runoff, 40% is still made up of single family homes and industrial area. The drainage area is not served by a stormwater collection system of any nature, and thus all runoff is carried overland into the study area. This drainage area is estimated at 0.67 square miles mostly outside the Wood River City Limits.

The project area itself has 0.24 square miles of contributing surface area, as defined by the 440.0 elevation contour. All of the project area is developed with single family homes on quarter-acre lots. Thirty-nine curb inlets (approximate total capacity of 66.7 cfs) are available in the study area to accept the runoff from the project area as well as the two outlying tributary areas.

The runoff that is accepted through the inlets travels out of the project area through the combined sewer. All other runoff is trapped within the project area. The sewer system has an estimated capacity of only 43.0 cfs (assuming 42" and 30" sewer mains at 0.9% slope, based upon being equivalent to the ground slope). This capacity neglects the requirements of any wastewater which may contribute to the combined sewer system during a flood event. Using the Rational Method, as described in the Stage 1 evaluation, the potential reduction in the amount of combined sewer flow which would result from this project is estimated to be 6.0 MG. This is a significant reduction, accounting for nearly one-third of the stormwater run-off from the design storm.

A new 108-inch diameter storm sewer would need to be constructed, as shown on **Figure 12** on the following page, across the BP Amoco property to ultimately gravity discharge to the Mississippi River.

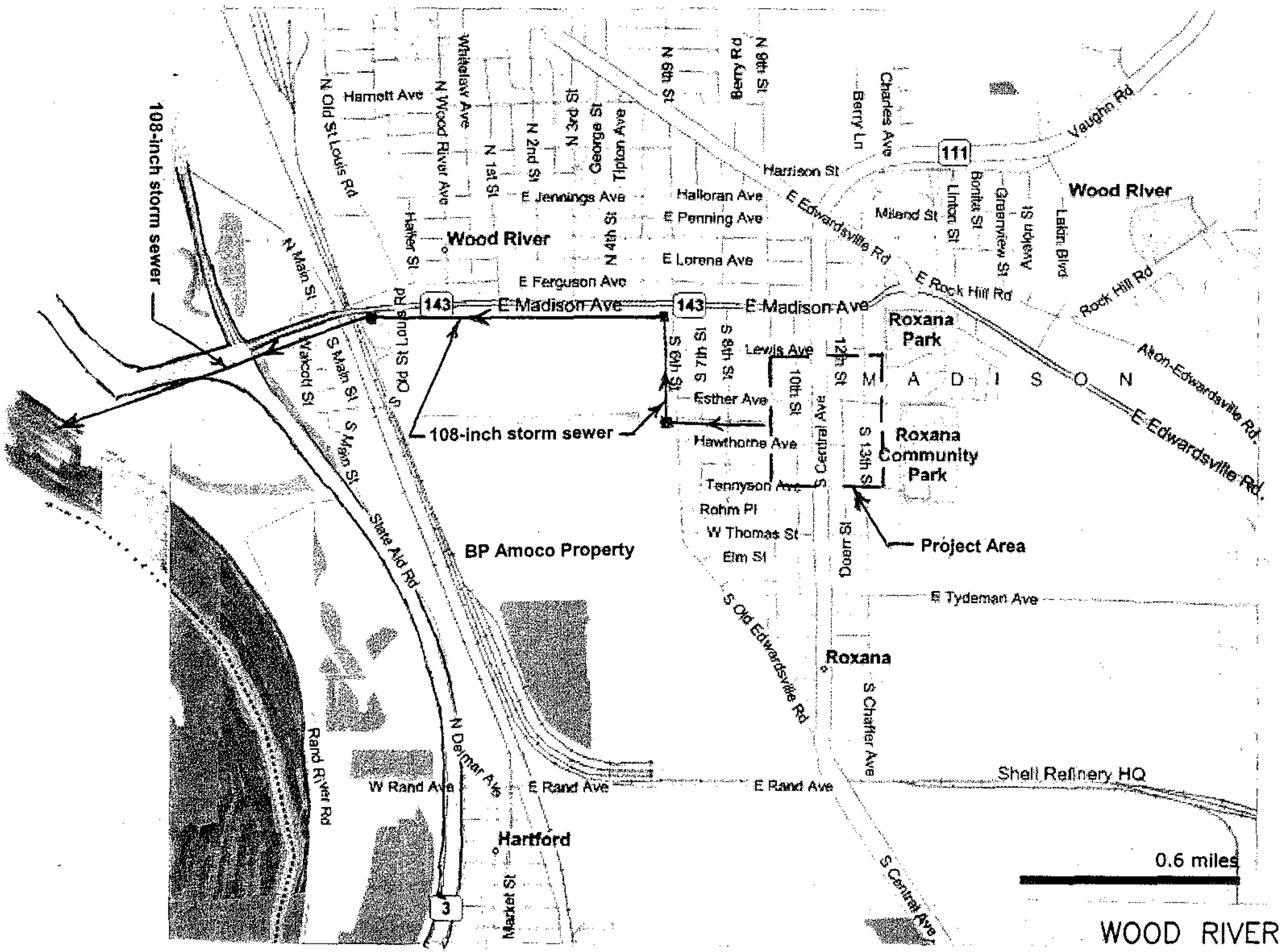


FIGURE 12

WOOD RIVER, ILLINOIS CSO LTCP

CENTRAL & HAWTHORNE SEWER SEPARATION PROJECT

HORNER & SHIFRIN, INC.

5200 Oakland Ave. St. Louis, Missouri 63110

640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

This alignment would include 5,400 feet of sewer located on BP Amoco property, and 4,130 feet of sewer located on fully-developed residential property – for a total of 9,700 feet of stormwater sewer. The total estimated cost for this sewer separation project, determined by adjusting the previously-reported 2002 costs for inflation, is approximately $13 million.

One possible means for implementing Option I.B. with a lower capital (construction cost) investment would be to incorporated a pump station and force main for a portion of the overall route to the River. This approach could greatly reduce the cost associated with installing a large-diameter, deep gravity sewer all of the way to the River. The downside of this approach is the capital cost to construct a rather large-capacity pump station, as well as the recurring O&M costs to operate that pump station of the next 40+ years.

Although this Option is significantly higher in capital cost than that of other Options considered, not only would it reduce combined sewage flows, but it would also alleviate one of the most troublesome inadequacies in the current collection system.

Several options for funding this project exist outside of the normal funding routes for CSO improvements. The first of these is to re-apply to the Illinois Department of Natural Resources for a grant for stormwater system improvements. It is believed that the original application was denied due to the lack of IDNR funds, and thus should be re-evaluated as a funding option.

In addition, a 150 acre portion of the BP Amoco site has been approved for re-development and is in the process of a market offering analysis. Stormwater sewers and sanitary sewers would need to be added to these areas regardless of what use the property was purchased for. It is conceivable that the developers of this property would contribute to the cost of a stormwater sewer discharging directly to the Mississippi River if storm drains on these properties were allowed to tie in.

All supporting cost estimates, calculations, and other information pertinent to the analysis of Option I.B. (above and beyond that contained in the 2002 prior study of this area contained in **Appendix R**) are presented in **Appendix S** herein.

**Analysis of Option IV.A.: Use of BP Amoco Lagoons for Storage
and Option VIII.C.: Interrupt Well Pumping at BP Amoco in Wet Weather**

As previously stated, a version of Option IV.A. was previously reviewed in detail in 1993 by Sheppard, Morgan & Schwaab, Inc for the City of Wood River, for presentation to the Illinois Pollution Control Board. The BP Amoco storage ponds are located just west of the WWTP, across Illinois Route 3 on BP Amoco riverfront property. The three storage ponds which make up this BP Amoco facility have a total combined storage capacity of 166.7 MG. These storage ponds are utilized by BP Amoco to store non-hazardous wastewater and storm water runoff from the Wood River BP Amoco Plant, for subsequent return to the sewer system and treatment at the Wood River Wastewater Treatment Facility.

A 72" diameter gravity combined sewer is utilized by BP Amoco to convey wastewater and stormwater to these ponds, which is then pumped to the Wood River Wastewater Treatment plant via the J-100 pumps located on the west side of the ponds.
In addition, the City of Wood River (by the terms of its contract with BP Amoco) can divert the entire wastewater flow entering its Wastewater Treatment Facility into BP Amoco's storage ponds during a shut down of the WWTP for maintenance.

The 1993 report by Sheppard, Morgan & Schwaab included a cost estimate for a diversion structure, 48" diameter interceptor sewer, pump station, 36" diameter force main and a discharge structure.

All supporting cost estimates, calculations, and other information pertinent to the analysis of Option IV.A. (accounting for the effects of Option VIII.C., which BP Amoco already employs during wet weather) are presented in **Appendix P**, herein.

Option VII.A. Analysis: End-of-Pipe Swirl / Vortex CSO Treatment System

As previously discussed as part of the Stage 1 Screening / Ranking of Identified CSO Control Alternatives, swirl concentrators and vortex separators have been in use for several years now throughout the world to provide a gross level of solids and floatable removal (approaching primary treatment performance, in some instances) from combined sewer flows. When properly applied / designed, a hydrodynamic separator can achieve essentially the same contaminant removal performance level as a primary sedimentation tank, but using only about a quarter of the plan area.

In order to predict actual solids removal efficiencies, particle settling velocity distribution must be determined, prior to final design, using samples of actual CSO flows. If necessary, chemicals can be added to further enhance solids separation by the swirl / vortex treatment system.

Approximate costs associated with this Option's inclusion in the Wood River Long Term CSO Control Plan would be approximately within the range of $370,000 for a design peak flow of 2 mgd up to $1.2 million for a design flow of 10 mgd. This estimate cost includes equipment, excavation, backfill, and installation costs. O&M costs for this piece of equipment should be negligible, unless it is determined that chemical addition is necessary to achieve the required solid removal efficiency.

It is conceivable that this swirl / vortex technology could be applied in Wood River as a stand-alone system, installed in the outfall sewer somewhere between the point where excess combined wastewater flow is diverted into the 84-inch and the point where the flow discharges into the Mississippi River. However, as discussed below, this technology would need to be used in conjunction with (as a precursor for) the application of disinfection technology for CSO treatment.

<u>Option VII.B. Analysis</u>: End-of-Pipe CSO Disinfection System

Again, as previously discussed as part of the Stage 1 Screening / Ranking of Identified CSO Control Alternatives, the existing disinfection equipment at the Wood River wastewater treatment plant utilizes gaseous chlorine, and is operated year-round. Upgrades to this system (to make it capable of meeting increased demands associated with disinfection of combined sewer flows, prior to the discharge of those flows to the Mississippi River) could be accomplished by adding more 150 lb chlorine cylinders, scales, gas feed equipment, a chlorine residual controller, and chlorine leak detector. However, this would require that disinfection of excess wet-weather wastewater flows (following primary sedimentation) occur at, or relatively near, the City's existing wastewater treatment plant – which may, or may not be compatible with other aspects of the overall Wood River CSO LTCP.

Increasing the existing WWTP chlorine gas disinfection system by 1 mgd was estimated to cost approximately $100,000. Most of the increased O&M costs would be attributed to the usage of chlorine, but additional maintenance of equipment and electricity usage would also need to be considered. Overall, chlorine disinfection of excess combined wastewater flows (as a means of removing / neutralizing potentially environmentally-harmful contaminants from CSO's prior to their release into the Mississippi River – in this instance, pathogenic organisms) would appear to represent a relatively economical CSO Control Alternative. However, the potential human health risks associated with the continued use of gaseous chlorine for disinfection – either for the "normal" WWTP effluent or for CSO's – must also be carefully considered.

In fact, the requirements of current Federal Risk Management Program Rule regulations are responsible for nearly all water and wastewater treatment (and other) facilities which are using gaseous chlorine either installing chlorine leak containment / scrubbing systems or abandoning their gaseous chlorine systems in favor of liquid hypochlorite, ultraviolet light, and other alternative disinfection systems.

Ultraviolet light (UV) disinfection technology, though substantially more costly to purchase and install than chlorine wastewater disinfection systems, is gaining widespread acceptance in the municipal wastewater treatment industry – both for continuous wastewater treatment plant effluent, and for intermittent CSO and other, disinfection applications. This increased use of UV disinfection systems for these purposes is primarily due to the significantly reduced safety risks and the substantially reduced operational complexity of UV systems, compared to chlorine or other chemical-based disinfection systems.

UV disinfection equipment to treat a 15 mgd flow was estimated to cost approximately $260,000 to procure, with a total installed cost of approximately $750,000. In order to be efficiently and consistently effective, though, UV disinfection requires a relatively low suspended solids concentration in the water to be disinfected.

UV disinfection works best with tertiary-treated wastewater effluent, still works very well with secondary-treated effluent, and can still be adequately effective for disinfecting primary-treated wastewater effluent. It is for this reason that the use of UV disinfection for CSO flows requires some degree of "pre-treatment", either using conventional primary treatment (clarification) or swirl / vortex technology.

Consequently, any further consideration of UV disinfection for pathogen destruction prior to discharge of CSO flows from Wood River into the Mississippi River, would need to also include costs associated with suspended solids removal "pre-treatment" of those flows prior to UV disinfection – unless, of course, the primary treatment and/or swirl / vortex was to be included in the Wood River CSO LTCP for some other reason (say, WWTP treatment capacity increase).

<u>Option VIII.A. Analysis</u>: Modify Exist'g WWTP Equipment To Increase Capacity

Again, as previously discussed in Stage 1 Screening / Ranking of Identified CSO Control Alternatives, modification of existing equipment to improve primary clarification and secondary treatment (coupled with an IEPA-approved re-rating of the wastewater treatment facility design treatment capacity, would appear to be a feasible, relatively economical way to create more capacity to treat CSO flows in the Wood River WWTP.

The necessary extent of increase in WWTP capacity cost-effectively achievable through such modifications, and the associated capital and increased O&M costs, are somewhat difficult to define, without first completing a thorough analysis of Wood River's combined sewer collection and treatment system. However, given that the WWTP was constructed in 1962, and that the last major upgrades to the WWTP were done in 1993 (achieving an increase in the current "rated" WWTP design capacity of 4.8 mgd of between 0.3 mgd and 0.6 mgd) would appear to be reasonable.

Since it would be proposed to achieve this increase solely by means of supplementing the existing major treatment equipment with removal-performance-enhancing "add-on" equipment (<u>without</u> the construction of additional treatment tankage, or piping, or buildings), it is estimated that the purchase and installation of such existing treatment equipment "enhancements" to implement this Option would not be likely to exceed $750,000.

The basic concept for Option VIII.A. would be to enable more combined wastewater flow to be directed through the existing primary and secondary treatment systems, <u>without</u> degrading the contaminant-removal-performance (treatment) capability of those existing primary and secondary treatment systems. This can be, and currently is being, accomplished (at existing WWTP's throughout the world) by means of the addition of plate or tube settler apparatus to primary and secondary clarifiers; and/or the addition of fixed biological media (or, in some cases, membranes) into dispersed-growth activated sludge aeration basins. **These, and other available, technologies will be considered as means for implementing Option VIII.A in Section VIII of this LTCP.**

END OF SECTION V.

VI. PUBLIC PARTICIPATION PROCESS

USEPA-published documents which provide guidance regarding the development of a CSO LTCP strongly emphasize the importance of the agency / municipality preparing the LTCP significantly involving their customers / citizens in that LTCP development process.

A. Existing Public Notification / Participation Approach

Although the City of Wood River has been notifying their citizens (and, in fact, the general public) of CSO events on a consistent basis for many years by means of the Wood River Public Services Department's Internet Website, no formal Public Notification Plan had been put into place. Thus, one other requirement of the aforementioned 2005 USEPA Administrative Order which mandated the City's development of this CSO LTCP, was that a Public Notification Plan be prepared and put into action prior to April 2006.

The required Public Notification Plan was developed by Horner & Shifrin, Inc. for the City of Wood River in March 2006 (using a December 2005 informal plan which the City had prepared in December 2005 as a basis). The March 2006 Public Notification Plan contains information on the procedures for posting CSO discharge events on the Wood River Public Services Department's Internet Website, placing additional signage at the location of the City's lone CSO outfall point, and establishing a public hot-line for citizens of the City concerned about CSO discharges and/or related environmental issues. A copy of the March 2006 Public Notification Plan (Administrative Order Response Item 6.) is included herein in **Appendix AA**.

In addition, the City of Wood River provides information regarding the City's wastewater / stormwater collection and treatment system, as well as many other governmental topics of interest to its citizens by means of a quarterly newsletter (The Pipeline) which is mailed to all City residents and posted on the City's Internet Website.

B. Public Participation in CSO LTCP Development Process

With respect to encouraging the public's participation in the City's process for developing a Long Term Control Plan (LTCP) for Combined Sewer Overflows (CSO), this activity was delayed to a substantial extent by the lack of rainfall events sufficiently significant to produce CSO's from the City's combined sewer system. This lack of CSO events made it impossible for the City to obtain needed data on the actual quantity and quality of CSO discharges – data which was essential to assessing the potential adverse environmental impact of the City's CSO discharges on the receiving stream (the Mississippi River). This environmental impact determination was, in turn, essential to the evaluation of CSO control alternatives and, more importantly from the public's perspective, it could be essential to the public's reaction to the benefit:cost analysis for implementing CSO controls.

For this reason, the City staff and Horner & Shifrin personnel felt that it would be prudent to wait to initiate public participation until at least some actual CSO discharge quantity / quality data had been obtained, and until certain key CSO control alternatives had been more fully evaluated.

Unfortunately, the "drought" of significant rainfall continued, until a point in time was reached wherein the USEPA-mandated deadline for completion of the City's CSO LTCP was closing in rapidly. For this reason, in early March 2007, it was decided by City staff and Horner & Shifrin personnel that information soliciting public participation in the CSO LTCP development process had to be distributed to the citizens of Wood River as quickly as possible; and that the date for conducting a public meeting, as soon as reasonably possible (to encourage and receive public input concerning the final draft CSO LTCP) had to be established.

Due to this level of urgency, and because of the City's sincere interest in obtaining public input, printed flyers containing information on the CSO LTCP process and inviting the citizens to attend a public meeting on April 16, 2007 was delivered to all of the residents of the City of Wood River (via insertion into the community newspaper – The Alton Telegraph) on March 21, 2007. A copy of this flyer is included herein as part of **Appendix T** to this LTCP.

Apparently owing (at least partly) to the fact that a municipal official election was scheduled for the following day (April 17), the attendance by the citizens of Wood River at the April 16 public meeting on the City's CSO LTCP was disappointing. Unfortunately, only three residents were present at this meeting (which consequently began at approximately 5:30 p.m. and ended at about 6:15 p.m.); but those three attendees were very interested in, and generally supportive of, the City's efforts to minimize the environmental impact of CSO discharges.

Reference should be made to **Appendix T** of this CSO LTCP for the list of citizen (and other) attendees at the April 16, 2007 public meeting; and for the written record of the discussions conducted and questions asked by the public at this meeting.

As indicated in the written record, the citizens attending this April 16 public meeting were most concerned about the potential impact that the anticipated expenditure of funds to construct the capital improvements to the City's combined wastewater collection and treatment system recommended by the CSO LTCP would have in terms of increasing their sewer bills. Obviously, these citizens (who were all elderly gentlemen) were hopeful that such increases could be kept to a minimum.

Also, as indicated in the written record, the citizens attending this April 16 public meeting were urged to continue their dialogue about the CSO LTCP with either City staff or the City's consulting engineer; and to provide any further input into known sewer system problem areas, preferences for certain CSO control options, suggestions for other CSO control options to be considered, and so on – either in writing or by phone.
The attending citizens were also encouraged to talk with their family, friends, and neighbors who were not in attendance at this meeting about the CSO LTCP; and to encourage those people to also become more involved in the process of development of the CSO LTCP.

C. Summary and Conclusions From Public Participation

As stated in the written record of the public meeting (contained in **Appendix T)**, the following were the major pertinent comments regarding the City of Wood River's CSO LTCP development, which were expressed by the public at the April 16 public meeting:

1. The annual average of 29 CSO discharges which the City of Wood River has experienced over the last few years is definitely perceived to be too many.

2. The concept of the City of Wood River using the existing riverfront storage ponds owned and operated by BP Amoco for temporary storage of combined wastewater from the City's collection system during wet weather events is a concept which was previously proposed, but not implemented. This approach is still perceived to be a very feasible and cost-effective CSO control option for the City of Wood River to implement.

3. The potential impact that the anticipated expenditure of funds to construct the capital improvements to the City's combined wastewater collection and treatment system recommended by the CSO LTCP will have, in terms of increasing the sewer bills of the residents of Wood River is very much a concern to the public.

As of the date of issuance of this LTCP for USEPA review, no further comments had been received by either City staff or the City's consulting engineer from the Citizens of Wood River regarding the City' development of the CSO LTCP.

END OF SECTION VI.

VII. NINE MINIMUM CONTROLS IMPLEMENTATION STATUS

The City of Wood River currently has in place the requirements to meet the nine minimum controls. Some of these are contained within the state-approved revised Combined Sewer System Operation Plan, while others were recently formalized through creation of documents requested by 2005 USEPA Administrative Order. A brief description of the City's current status with respect to compliance with the nine minimum controls is provided below.

A. Approved Combined Sewer System Operational Plan

Originally created and approved in September of 1997, this Operational Plan was slightly revised, and then re-approved in March of 2003. This Plan document contains the Sewer Use Ordinance, the NPDES permit, Intergovernmental Agreements, the Amoco Agreement, a description of the sewer system and related lift stations, screening devices, a pollution prevention plan, and system control descriptions. A copy of this Plan document is available to the public from the City of Wood River Public Services Department Office.

The current (2003-developed) version of this Plan document will need to be revised by City staff, to reflect the necessary changes resulting from the implementation of the recommendations / changes contained in the final version of this CSO Long Term Control Plan.

In addition to the Combined Sewer Operational Plan, a Corrective Action Plan for Improving the City's Combined Sewer System Operation & Maintenance Record-Keeping was created in December of 2005 by Horner & Shifrin, Inc. for the City of Wood River in response to the 2005 USEPA Administrative Order. This document clarifies inspection schedules and record-keeping tasks related to the Combined Sewer Operational Plan. This Corrective Action Plan for Improving the City's Combined Sewer System Operations & Maintenance Record-Keeping can be found in **Appendix X** of this LTCP.

B. Use of Collection System for Storage

The use of the collection system for storage of flow was informally addressed in the original Combined Sewer System Operational Plan; in that this document states that the height of the coffer dam is set at a level in which if raised, would create surface flooding and basement backups during wet weather. Use of the collection system for storage is discussed in the Plan for Optimizing Storage in the City's Combined Sewer System to reduce CSO discharges, which can be found in **Appendix BB**, herein.

C. Flow Capture for Treatment Maximization Plan

The capture of flow for treatment maximization was informally addressed in the original Combined Sewer System Operational Plan in that this document states that the height of the coffer damn is set at a level that if raised, would create surface flooding and basement backups during wet weather.

A formalized Maximization of Flow to the POTW for Treatment Plan was developed by Horner & Shifrin, Inc. for the City of Wood River in March of 2006 in response to the 2005 USEPA Administrative Order. This document contains a description of the operations of the combined sewer system and wastewater treatment plant for maximum treatment of flow, as well as previously considered alternatives to further maximize the amount of flow treated. This document can be found in **Appendix Y**, in this LTCP.

D. Pretreatment

The City of Wood River does not have any significant non-domestic dischargers and therefore has no pretreatment program, nor the Ordinance-established authority to administer a pretreatment program.

E. Control of Solid and Floatable Materials in CSOs

The control of solid and floatable materials in CSOs is discussed in the Combined Sewer Operational Plan with the description of the screening facilities located at the Levee District Pump Station. This equipment was installed as part of the CSO upgrades finished in 1993.

F. Pollution Prevention Plan

A more detailed description of pollution prevention practices and record-keeping than what is currently contained within the Combined Sewer Operational Plan was developed by Horner & Shifrin, Inc. for the City of Wood River in January of 2006 in response to the 2005 USEPA Administrative Order. This Pollution Prevention Plan describes the scope, frequency, and record-keeping requirements for the pollution prevention practices of street cleaning, leaf pick-up program, solid waste collection and recycling, hazardous waste collection days, sewer flushing, catch basin cleaning, manhole rehabilitation, sewer main rehabilitation, odor control, and public education programs. This document can be found in **Appendix Z**, herein.

G. Public Notification Plan

Although the City of Wood River has been notifying the public of CSO events on a consistent basis, no formal Public Notification Plan had been developed, and thus was required under the 2005 USEPA Administrative Order. This document was developed by Horner & Shifrin, Inc. for the City of Wood River in March 2006 and contains information on the procedures for posting CSO discharge events on the Wood River Public Services Department Website, signage at the CSO outfall, and a public hot-line for concerned citizens. This Public Notification Plan can be found in **Appendix AA**, herein.

H. Sewer System Optimization Plan

A formal Sewer System Optimization Plan was prepared for the City of Wood River by Horner & Shifrin, Inc. in January of 2006 entitled Plan for Optimizing Sewer System Storage to Minimize Frequency, Duration, and Volume of CSO Discharges in compliance with the 2005 USEPA Administrative Order. This document describes the activities that the City completes in order to best optimize the sewer system, including inspections, tide gate maintenance, regulator settings, inflow retardation, localized upstream detention, lift station operations, and removal of obstruction to flow. The Plan for Optimizing Sewer System Storage to Minimize Frequency, Duration, and Volume of CSO Discharges can be found in **Appendix BB**, herein.

I. Sewer Use Ordinance

The Sewer Use Ordinance is contained within the Combined Sewer Operational Plan. This Ordinance was last revised in 1997 to reflect the upgrades to the wastewater treatment plant as well as the intergovernmental agreements made for the treatment of wastewater generated in neighboring communities.

J. Recommended Future Action

In order to promote continued compliance by the City of Wood River with the intent of USEPA's Nine Minimum Controls, it is recommended that City staff (or an objective third-party retained by the City) perform a bi-annual (every two years) review – similar to that performed as part of the development of this LTCP – of each of the major component plans / ordinances / and other documents which provide the methodology and authorities for Wood River's implementation of the nine minimum controls.

It is further recommended that this bi-annual review (or evaluation) be conducted using the USEPA-developed Evaluation Checklist contained in **Appendix GG**, herein.

END OF SECTION VII.

VIII. DETAILED EVALUATION OF SELECTED CSO ALTERNATIVES

Based on the initial screening / ranking and subsequent analysis (preliminary evaluation), presented in Section V of this LTCP, of the nineteen different CSO Control Alternatives (Options) identified for consideration for possible inclusion in the CSO Long Term Control Plan for the City of Wood River, the following seven Options were selected to be subjected to the detailed evaluation described in this Section:

<u>Option I.A.</u>	**Wood River Sanitary / Storm Sewer Separation - Madison Avenue Area**
<u>Option I.B.</u>	**Wood River Sanitary / Storm Sewer Separation - Central & Hawthorne Area**
<u>Option IV.A.</u> and <u>Option VIII.C.</u>	**Peak Flow Attenuation by Temporary Off-Line Storage Using Existing BP Amoco Storage Ponds** **Interrupt Well Pumping at BP Amoco During Wet Weather**
<u>Option VII.A.</u> and <u>Option VII.B.</u>	**CSO End-of-Pipe Swirl / Vortex Treatment System** **CSO End-of-Pipe Alternate Disinfection Treatment System**
<u>Option VIII.A.</u>	**Modify Existing WWTP Equipment to Increase Treatment Capacity**

The purpose of this Section of the CSO Long Term Control Plan for the City of Wood River is to discuss the methodology used for more detailed evaluation of each of the above five CSO Control Options (or combinations of Options), review the identified relative advantages and disadvantages of including each of the five Options in the Wood River CSO LTCP, determine the relative benefit:cost ratio of each Option (for use in prioritizing implementation of Options), and then present the resulting recommendations, as to whether or not each of the five CSO Control Options should be included in Wood River's CSO LTCP.

Later, in Section XI of this CSO LTCP, the sequence for (and anticipated duration of) the implementation of each of the Options recommended for implementation will be defined.

A. <u>Option I.A.</u>: Wood River Sanitary / Storm Sewer Separation -- Madison Avenue Area

The analysis of this Option previously-presented in Section V. of this LTCP (refer to Pages V-2 and V-23) was completed to a level of detail sufficient to enable the conclusion to have already been drawn that **<u>Option I.A.</u> is definitely worthy of recommendation for inclusion in the CSO LTCP for the City of Wood River**.

More detailed evaluation, at this time, is therefore not necessary; and would, in fact, constitute preliminary design (effort which is beyond the scope of this CSO LTCP).

The only aspect of implementation of Option I.A. which does require further evaluation is a determination of a quantitative value for the benefit:cost ratio to be assigned to the implementation of this CSO Control Option (to provide a basis for prioritizing the implementation of this Option in comparison to other recommended CSO Control Options).

For such purposes, it has been assumed that the most logical method of calculating the benefit:cost ratio for CSO Control Options considered in this CSO LTCP's development is to divide the estimated quantity of combined wastewater flow that implementation of a given CSO Control Option would eliminate from the potential CSO discharge of the City of Wood River during the design-storm wet weather event (in Million Gallons, or MG) by the estimated dollar amount capital cost to implement that CSO Control Option.

On that basis, **Option I.A.'s calculated benefit:cost ratio** would be (using the values previously-presented in Section V. on Pages V-23 and -24):

0.21 MG / $ 1.7 million = **0.12**

B. <u>Option I.B.</u>: Wood River Sanitary / Storm Sewer Separation - Central & Hawthorne Area

Similarly, the analysis of this Option previously-presented in Section V. of this LTCP (refer to Pages V-3 and V-25) was completed to a level of detail sufficient to enable the conclusion to have already been drawn that **Option I.B. is very likely to be worthy of recommendation for inclusion in the CSO LTCP for the City of Wood River**. Therefore, more detailed evaluation of **Option I.B.**, at this time, is not necessary; and would, in fact, constitute preliminary design (effort which is beyond the scope of this CSO LTCP).

The only aspect of implementation of **Option I.B.** which does require further evaluation is a determination of a quantitative value for the benefit:cost ratio to be assigned to the implementation of this CSO Control Option (to provide a basis for prioritizing the implementation of this Option in comparison to other recommended CSO Control Options).

For such purposes, it has been assumed that the most logical method of calculating the benefit:cost ratio for CSO Control Options considered in this CSO LTCP's development is to divide the estimated quantity of combined wastewater flow that implementation of a given CSO Control Option would eliminate from the potential CSO discharge of the City of Wood River during the design-storm wet weather event (in Million Gallons, or MG) by the estimated dollar amount capital cost to implement that CSO Control Option.

On that basis, **Option I.B.'s calculated benefit:cost ratio** would be (using the values previously-presented in Section V. on Page V-25):

6.0 MG / $ 13 million = **0.46**

While this benefit:cost ratio may well be relatively favorable (compared to other CSO Control Options being considered by the City of Wood River), the fact that implementation of **Option I.B.** would involve such a significant capital expenditure (approximately $13 million) serves to make the inclusion of implementation of this Option as part of Wood River's CSO Long Term Control Plan questionable.

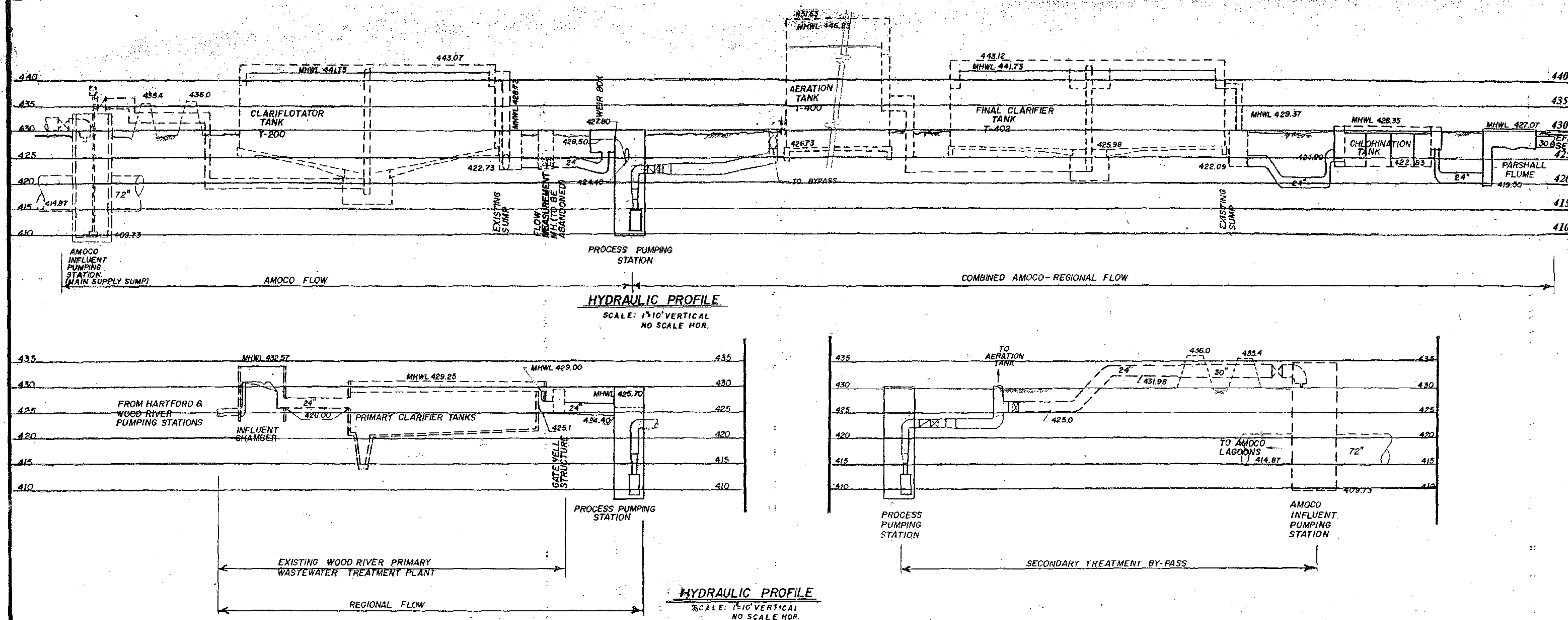
Other considerations which must be factored into the decision as to whether to include **Option I.B.** in this CSO LTCP are discussed (and the final recommendation regarding **Option I.B.**) are presented in sub-Section F. of this Section VIII.

C. <u>Option IV.A.</u> and <u>Option VIII.C.</u> Peak Flow Attenuation by Temporary Off-Line Storage Using Existing BP Amoco Storage Ponds Interrupt Well Pumping at BP Amoco During Wet Weather

The suitability of **Option IV.A.** for inclusion as part of this CSO LTCP was sufficiently indicated by the Stage 1 initial screening / ranking of CSO control alternatives, as well as the Stage 2 preliminary evaluation of alternatives, to warrant Option IV.A. being further evaluated in this Section VIII; and, as previously stated in the discussion of Option VIII.C. in Section V. of this LTCP, BP Amoco and the City of Wood River have previously implemented a version of Option VIII.C. – meaning that **Option VIII.C.** can and will be incorporated in the implementation of Option IV.A. (if it proves feasible to include **Option IV.A.** in Wood River's CSO LTCP).

A substantial amount of effort was expended in properly evaluating the feasibility of the City of Wood River using the existing BP Amoco riverfront storage ponds (in conjunction with BP Amoco's continued use of those storage ponds) for temporary storage of excess combined wastewater flows, in order to significantly reduce the number of CSO discharges by the City. This effort included the following significant, labor-intensive tasks:

- determining (in conjunction with BP Amoco and its consultants) the actual volume of the existing storage ponds.
- determining (in conjunction with BP Amoco and its consultants) the quantities of stormwater runoff from BP's Wood River facilities which must be "accommodated" during wet weather, <u>both</u> in the capacity of the 72" sewer which conveys BP Amoco's combined wastewater flows to either the City's WWTP or to BP's riverfront storage ponds <u>and</u> with respect to "reserving" sufficient volumes to store such flows in the BP Amoco riverfront storage ponds.
- determining (in conjunction with BP Amoco and its consultants) the hydraulic feasibility of diverting Wood River's combined wastewater from the 84" sewer to BP Amoco's existing storage ponds, AND then returning that diverted flow back to the sewer leading to the City's WWTP – preferably <u>without</u> the need for pumping. (Refer to the combined sewage conveyance and treatment system hydraulic profiles for the BP Amoco and the City of Wood River in **Figure 13**, on the following page).



Wood River, IL – Long Term CSO Control Plan
Existing Combined Wastewater Treatment Facilities
Hydraulic Profiles

FIGURE 13

WOOD RIVER, ILLINOIS CSO LTCP

HORNER & SHIFRIN, INC.
5200 Oakland Ave. St. Louis, Missouri 63110
640 Pierce Boulevard, Suite 200, O'Fallon, Illinois 62269

- determining whether it would be reasonable to expect that a "typical" volume of the City's temporarily-stored combined wastewater could be returned ("bled back") from the storage ponds through the City's WWTP for eventual discharge BEFORE another wet weather event (which necessitated another use of the storage ponds by the City) occurred.

The results obtained from the completion of the above-described tasks (as well as other related activities) are described in the titled sections that follow, in the order they are presented above.

Determination of Storage Pond Capacity
In the May 3, 2007 meeting between personnel from BP Amoco and their consultant (URS Corp.) and H&S staff, the BP Amoco personnel indicated that BP was still in the process of completing a physical field survey of their existing riverfront storage pond "complex", which was necessary to accurately determine the existing total storage volume which this "complex" can provide.

This determination directly relates to the question of how much storage volume can BP Amoco safely make available to the City of Wood River, without compromising BP Amoco's use of these storage ponds.

Due to the time constraints relating to the submittal of Wood River's final draft CSO LTCP to USEPA for review, it was decided at the May 3 meeting that (for purposes of the LTCP, and until this field survey can be completed) the City of Wood River should count on a total useable capacity of at least **150 Million Gallons of storage in BP's riverfront storage ponds** (which is the amount that BP Amoco is currently required to make available to the City in BP Amoco's agreement with the City for treatment of BP's wastewater by the City's WWTP). **However, it is important to note that this volume will not be available during the entire month long shutdown to perform maintenance on the WWTP secondary treatment train, which occurs on an annual basis, if this Option is implemented as the sole CSO control option.**

Determination of "Reserve" Capacity to Accommodate BP Amoco Flows
In the May 3, 2007 meeting between personnel from BP Amoco, their consultant (URS Corp.), and H&S staff, BP Amoco personnel also indicated that BP was still in the process of researching the basis of design for BP's current stormwater management system, which was information that was definitely needed for BP Amoco and its consultants to respond to the critical question regarding the quantity of runoff from its Wood River facilities which BP must convey to, and store in, BP's riverfront storage ponds.

Subsequent guidance obtained from BP Amoco's consultant (URS Corp.) that, at this point in time, the best answer which BP could provide regarding the stormwater runoff from their Wood River facilities would be for Wood River to use the basis of stormwater system design information contained in the previous June 1993 study prepared by Sheppard, Morgan & Schwaab, Inc. (See **Appendix P**).

The reported amount of runoff from the BP facility for a 3 inch recurring rainfall is approximately 15.5 MG, and from a 10 year, 24 hour storm (1.8 in/hr) is approximately 25.6 MG. Assuming that in the case of a 10 year frequency storm, the City of Wood River will produce such high stormwater flow rates and volumes that a CSO discharge is inevitable, due to the entire capacity of the 72" sewer being utilized to handle runoff from the BP Amoco facility (which, as part of this alternative, would be modified to also carry Wood River CSO flows to the storage ponds), it is not deemed necessary to reserve this 25.6 MG of capacity in the storage ponds. However, even though a 3 inch recurring rainfall produces over 75% of the stormwater runoff as that of the entire City of Wood River for the design storm (three month, one hour storm, 0.81 in/hr) reserving a capacity of 15.5 MG for BP Amoco stormwater runoff flows allows for a large enough volume to be reserved for use by BP Amoco in the event of a heavy rainfall occurring while the storage ponds still contain CSO flows from the previous rain event.

The peak instantaneous flow rate from the BP Amoco facility during a 10 year, 24 hour storm is reported to be 165,000 gpm. This is such a high runoff rate, that even the Levee District Pump Station, designed to discharge the CSO flow generated in the entire Wood River sewer system tributary area to the Mississippi River during high river stages, does not have this available capacity. The maximum capacity of the Levee District Pump Station is 117,000 gpm, which is assumed to be the peak runoff rate for the City of Wood River for a conservative design storm (documents which detail the design basis for this pump station are not available). Peak instantaneous flow rates for other design storms for the BP Amoco facility are not known, and since modeling was beyond the scope of this LTCP, the peak runoff rate from the City of Wood River for the design storm is also not known. Thus the capacity of the 72" sewer was determined using the proposed modifications to the system (that would allow CSO flows access to the 72" BP Amoco sewer), and then evaluated for adequacy. This is discussed if the section below.

Hydraulic Feasibility

In determining the hydraulic feasibility of directing CSO flows from the City of Wood River to the BP Amoco storage ponds, two main factors governed the approach taken.

- Diverting CSO flows from the 84" sewer upstream of its connection with the Levee District Pump Station forebay is the preferred way of implementing this option due to the WWTP effluent discharge into the Levee District Pump Station forebay. Thus, if diversion of CSO flows were to occur downstream of the Levee District Pump Station forebay, not only would CSO flows be diverted to the BP Amoco storage ponds, but so would the Wood River Wastewater Treatment Plant effluent. Since the WWTP effluent would be combined with the CSO flows, the entire volume of water would need to be treated before being discharged, effectively increasing the volume of flows from a CSO needing to be returned to the WWTP for treatment by a volume equal to the peak flow rate of the WWTP (effectively treating the peak WWTP flow rate twice).

- The floor elevation of the 72" BP Amoco sewer near the Levee District Pump Station forebay is approximately 5 feet higher than that of the floor elevation of the 84" Wood River combined sewer (72" EL 414.53; 84" EL of 409.7). This is the reasoning behind the recommendation of the construction of a new pump station that was given in the June 1993 report by Sheppard, Morgan, and Schwaab. However, the construction of a new pump station to handle peak runoff rates from the City of Wood River, along with the associated O&M costs would be inhibitive.

The two above described issues were the main concerns needing to be addressed in the determination of the hydraulic feasibility of diverting Wood River CSO flows to the BP Amoco storage ponds. In reviewing the plans and operational description of the Levee District Pump Station, it was noted that the maximum water level in the wet well for the pumps is at an elevation of 422.0, while there is also an emergency overflow in the forebay with a discharge elevation of 423.0. Since the Levee District Pump Station is reportedly utilized 6 months out of the year, and emergency overflows into the Levee District impoundment area have occurred in the past without surface flooding or basement backups upstream of the pump station, it was deemed that the maximum allowable water level in the new diversion structure could be set at 423.0.

Conceptual design of the recommended interception facilities upstream of the Levee District Pump Station forebay can be found in **Appendix GG**. The recommended diversion structure consists of a new rectangular vault, 84" sluice gate, bar screen, and downward opening weir gate. It is important to note that the 36" WWTP effluent line will bisect this new structure, but will not discharge into it. This allows for WWTP effluent to continue to be discharged to the River (either by gravity or by pumping), while CSO flows are being diverted to the BP Amoco storage ponds.

With the BP Amoco storage pond at a water level elevation of 421.0, hydraulic calculations were performed to determine the capacity of the 72" BP Amoco sewer with the restriction of the maximum water level in the new diversion structure being set at 423.0. This analysis resulted in a maximum achievable flow rate of CSO flow from the proposed diversion structure to the BP Amoco storage ponds of 13,333 gpm (19 mgd). The total capacity of the 72" BP Amoco sewer under these conditions is 20,000 gpm (29 mgd). Thus, the actual amount of flow reserved in the BP Amoco 72" sewer for stormwater runoff from the BP Amoco facility is approximately 6,667 gpm (10 mgd).

Based on the evaluation of the historical records of the City of Wood River regarding the frequency, intensity, and duration of wet weather events which had produced CSO discharges due to excess (greater than the capacity of the City's WWTP) wet weather combined sewage volumes from January 2002 through March 2007 (see **Table 17**); it was determined that roughly 2/3 of the wet weather events during that period produced a total CSO quantity less than or equal to 7 Million Gallons (MG). It was further determined that the average duration of the CSO events during the January 2002 though March 2007 period was 3.5 hours (or 210 minutes). Thus, the expected average combined wastewater flowrate from the City of Wood River is 33,000 gpm (7,000,000 gallons / 210 minutes).

Table 17 Wood River CSO Discharge Volume and Frequency, Storage Pond Capacity, and WWTP Capacity Evaluation (January 2002 through March 2007)

Event Date	Event Duration (hr)	Estimated Rainfall (in)	Estimated Duration of CSO Discharge (hr)	Estimated Amount Discharged (mg)	CSO Events Sorted by Estimated Volume Discharged (x, MG) x<=5	5<x<=10	10<x<=20	x>20	Days Between CSO Discharge Events	Estimated Amount of Time Required to Return Stored Flow to WWTP* (hr)	Estimated Amount of Time Required to Return Stored Flow to WWTP* (days)	Does CSO Occur Before Previously Stored Volume Has Been Treated?	Capacity of Storage Ponds Being Consumed
1/29/2002	21.0	2.2	4.5	4	1	0	0	0		72	3.00	0	
2/19/2002	21.5	0.7	2	4	1	0	0	0	21	72	3.00	0	
3/2/2002	5.0	0.45	9	12	0	0	1	0	11	192	8.00	0	
3/15/2002	4.0	0.55	2	3	1	0	0	0	13	57	2.38	0	
3/28/2002	1.0	0.05	1	1	1	0	0	0	13	27	1.13	0	
4/7/2002	17.5	0.8	1	2	1	0	0	0	10	42	1.75	0	
4/19/2002	6.0	1.4	4	10	0	1	0	0	12	162	6.75	1	7.60
4/21/2002	1.0	0.15	1	1	1	0	0	0	2	27	1.13	0	-0.20
4/27/2002	6.5	1.1	4.2	10	0	1	0	0	6	162	6.75	0	
5/6/2002	8.5	0.65	2.5	18	0	0	1	0	9	282	11.75	1	17.20
5/7/2002	6.5	2.85	3.5	32	0	0	0	1	1	492	20.50	1	42.00
5/12/2002	16.5	4.4	16	82	0	0	0	1	5	1242	51.75	1	118.40
5/16/2002	3.8	0.4	2.25	16	0	0	1	0	4	252	10.50	1	133.60
5/17/2002	8.5	0.8	5	35	0	0	0	1	1	537	22.38	1	139.00
6/5/2002	3.0	0.40	1.25	4	1	0	0	0	19	72	3.00	0	135.80
6/10/2002	3.0	0.90	3.00	6	0	1	0	0	5	102	4.25	1	141.00
6/11/2002	0.8	1.75	2.25	12	0	0	1	0	1	192	8.00	0	131.40
6/25/2002	2.0	0.30	1.25	5	1	0	0	0	14	87	3.63	0	87.60
7/26/2002	2.3	0.33	2.25	6	0	1	0	0	31	102	4.25	0	68.80
8/11/2002	5.0	2.05	2.50	4	1	0	0	0	16	72	3.00	0	65.60
8/16/2002	1.0	0.50	1.00	4	1	0	0	0	5	72	3.00	1	67.20
8/18/2002	3.5	0.75	4.00	4	1	0	0	0	2	72	3.00	1	70.40
8/19/2002	1.5	1.25	1.00	7	0	1	0	0	1	117	4.88	1	71.80
8/23/2002	2.0	0.35	1.00	4	1	0	0	0	4	72	3.00	0	36.60
9/17/2002	6.5	0.60	2.75	5	1	0	0	0	25	87	3.63		
9/19/2002	2.6	1.40	4.60	4	1	0	0	0	2	72	3.00		
9/20/2002	7.0	0.40	1.75	0	1	0	0	0	1	12	0.50		
10/4/2002	4.3	0.25	1.50	1	1	0	0	0	14	27	1.13	0	
10/6/2002	3.5	0.35	2.00	1	1	0	0	0	2	27	1.13	0	
10/25/2002	6.5	0.80	3.00	2	1	0	0	0	19	42	1.75	0	
11/5/2002	3.0	0.45	2.00	2	1	0	0	0	11	42	1.75	0	
12/18/2002	13.5	1.10	1.50	1	1	0	0	0	43	27	1.13	0	
2/14/2003	6.0	0.35	2.50	4	1	0	0	0	58	72	3.00	0	
2/18/2003	0.5		1.00	1	1	0	0	0	4	27	1.13	0	
3/13/2003	2.0	0.60	1.25	1	1	0	0	0	23	27	1.13	0	
3/19/2003	3.8	0.45	2.75	3	1	0	0	0	6	57	2.38	1	2.20
3/20/2003	0.1	0.10	0.90	1	1	0	0	0	1	27	1.13	0	-8.80
3/28/2003	7.0	0.30	3.00	6	0	1	0	0	8	102	4.25	0	
4/4/2003	1.0	0.35	2.00	3	1	0	0	0	7	57	2.38	0	
4/20/2003	2.5	0.75	2.50	3	1	0	0	0	16	57	2.38	0	
4/24/2003	6.0	0.70	4.00	4	1	0	0	0	4	72	3.00	1	3.20
4/25/2003	4.0	0.60	4.00	6	0	1	0	0	1	102	4.25	1	5.20
4/28/2003	1.8	0.30	2.25	3	1	0	0	0	3	57	2.38	0	-0.60
5/4/2003	8.0	1.20	3.50	5	1	0	0	0	6	87	3.63	0	
5/8/2003	3.0	0.30	2.50	5	1	0	0	0	4	87	3.63	1	2.60
5/10/2003	3.0	1.15	2.50	10	0	1	0	0	2	162	6.75	0	-18.60
5/30/2003	2.0	0.45	1.00	1	1	0	0	0	20	27	1.13	0	
6/10/2003	2.5	0.65	3.00		1	0	0	0	11	12	0.50	0	
6/12/2003	2.5	1.45	2.00		1	0	0	0	2	12	0.50	0	
6/26/2003	8.0	3.45	7.00	43	0	0	0	1	14	657	27.38	1	8.60
7/18/2003	5.5	1.25	2.00	4	1	0	0	0	22	72	3.00	0	-2.60
7/28/2003	1.5	0.38	1.00	1	1	0	0	0	10	27	1.13	0	
9/1/2003	7.5	1.85	6.00	15	0	0	1	0	35	237	9.88	0	
9/26/2003	3.0	0.85	1.50	4	1	0	0	0	25	72	3.00	0	
10/9/2003	2.5	0.65	3.00	4	1	0	0	0	13	72	3.00	0	
11/1/2003	7.0	0.50	2.00	2	1	0	0	0	23	42	1.75	0	
11/17/2003	6.5	4.00	4.00	29	0	0	0	1	16	447	18.63	1	28.20
11/18/2003	0.5	0.05	2.50	7	0	1	0	0	1	117	4.88	0	2.40
12/9/2003	0.5	0.15	1.00	1	1	0	0	0	21	27	1.13	0	-16.60
12/22/2003	11.0	0.95	6.00	6	0	1	0	0	13	102	4.25	0	
1/4/2004	13.5	2.55	4.25	14	0	0	1	0	13	222	9.25	0	
1/17/2004	20.0	0.70	1.00	2	1	0	0	0	13	42	1.75	0	
2/2/2004	6.0	0.70	2.50		1	0	0	0	16	12	0.50	0	
3/4/2004	7.0	1.55	5.00	9	0	1	0	0	31	147	6.13	0	
3/25/2004	4.0	0.35	2.50	3	1	0	0	0	21	57	2.38	1	2.20
3/26/2004	4.0	1.25	3.00	5	1	0	0	0	1	87	3.63	0	-38.40
4/24/2004	10.5	1.20	5.00	6	0	1	0	0	29	102	4.25	0	
4/30/2004	1.5	1.60	2.00	14	0	0	1	0	6	222	9.25	0	
5/12/2004	2.0		1.00	1	1	0	0	0	12	27	1.13	1	0.20
5/13/2004	21.0	3.20	20.00	17	0	0	1	0	1	267	11.13	1	8.40
5/19/2004	5.0	0.85	3.50	4	1	0	0	0	6	72	3.00	0	3.60
5/25/2004	6.0	0.90	4.25	7	0	1	0	0	6	117	4.88	1	9.80
5/26/2004	6.0	1.90	4.00	5	1	0	0	0	1	87	3.63	1	14.00
5/27/2004	4.5	0.75	6.00	17	0	0	1	0	1	267	11.13	1	27.00
5/30/2004	3.0	0.75	3.00	7	0	1	0	0	3	117	4.88	0	18.80
6/9/2004	6.0	0.35	2.50	3	1	0	0	0	10	57	2.38	0	13.00
6/15/2004	0.5	0.50	1.50	2	1	0	0	0	6	42	1.75	1	14.20
6/16/2004	6.0	3.30	5.00	14	0	0	1	0	1	222	9.25	0	-3.00
7/6/2004	8.5	1.10	4.00	14	0	0	1	0	20	222	9.25	0	
7/30/2004	8.5	2.70	4.00	11	0	0	1	0	24	177	7.38	1	3.80
8/4/2004	2.0	0.65	2.00	4	1	0	0	0	5	72	3.00	0	-21.80
8/23/2004	1.5	0.45	2.00	6	0	1	0	0	19	102	4.25	1	5.20
8/24/2004	3.3	0.50	1.50	4	1	0	0	0	1	72	3.00	1	8.40
8/25/2004	2.5	1.25	2.50	7	0	1	0	0	1	117	4.88	0	-17.40
9/15/2004	4.0	0.70	2.50	80	0	0	0	1	21	1347	56.13	1	
10/12/2004	3.5	0.40	1.75	4	1	0	0	0	27	72	3.00	1	1.60
10/14/2004	16.0	0.65	6.00	3	1	0	0	0	2	57	2.38	0	-1.00
10/18/2004	16.0	1.25	7.50	20	0	0	1	0	4	312	13.00	1	
10/26/2004	3.3	0.60	2.00	5	1	0	0	0	8	87	3.63	0	
12/6/2004	12.0	1.75	5.00	24	0	0	0	1	41	372	15.50	0	
1/2/2005	13.0	2.00	6.50	13	0	0	1	0	27	207	8.63	1	10.60
1/4/2005	24.0	2.65	16.00	30	0	0	0	1	2	462	19.25	1	39.80
1/5/2005	2.5	1.00	2.50	3	1	0	0	0	1	57	2.38	0	32.40
1/12/2005	13.5	2.85	8.00	21	0	0	0	1	7	327	13.63	0	12.60
2/7/2005	3.0	0.35	2.00	4	1	0	0	0	26	72	3.00	0	7.80
2/13/2005	8.5	0.70	4.00	9	0	1	0	0	6	147	6.13	0	-41.60
3/22/2005	8.3	1.50	7.75	32	0	0	0	1	37	492	20.50	0	
6/8/2005	1.5	0.35	1.50	3	1	0	0	0	78	57	2.38	0	
6/13/2005	2.5	1.20	3.00	9	0	1	0	0	5	147	6.13	0	
6/25/2005	1.0	0.90	2.50	10	0	1	0	0	12	162	6.75	0	
7/11/2005	17.0	1.15	12.00	7	0	1	0	0	16	117	4.88	1	1.40
15-Jul	2.0	1.00	2.00	10	0	1	0	0	4	162	6.75	1	7.40
7/18/2005	1.5	0.60	2.00	9	0	1	0	0	3	147	6.13	0	-27.60
8/15/2005	12.0	2.25	8.00	50	0	0	0	1	28	762	31.75	1	34.80
8/25/2005	1.5	1.00	2.00	9	0	1	0	0	10	147	6.13	1	43.00
8/26/2005	1.8	0.45	1.50	4	1	0	0	0	1	72	3.00	1	43.00
8/29/2005	1.5	0.20	1.50	8	0	1	0	0	3	132	5.50	0	26.20
9/14/2005	2.5	0.55	1.75	2	1	0	0	0	16	42	1.75	1	
9/15/2005	5.0	0.70	4.00	5	1	0	0	0	1	87	3.63	0	
9/19/2005	6.0	2.00	3.50	10	0	1	0	0	4	162	6.75	1	
9/25/2005	14.0	1.35	3.00	10	0	1	0	0	6	162	6.75	1	
9/28/2005	2.5	0.60	2.00	4	1	0	0	0	3	72	3.00	0	
10/20/2005	4.5	0.40	1.00	2	1	0	0	0	22	42	1.75	0	
10/31/2005	12.5	1.20	9.00	17	0	0	1	0	11	267	11.13	0	
11/14/2005	11.5	1.05	8.00	5	1	0	0	0	14	87	3.63	0	
11/27/2005	7.0	1.55	5.50	20	0	0	1	0	13	312	13.00	0	
1/10/2006	12.0	0.65	1.50	3	1	0	0	0	44	57	2.38	0	
1/28/2006	13.0	0.85	4.50	14	0	0	1	0	18	222	9.25	0	
2/16/2006	2.0	0.45	1.50	4	1	0	0	0	19	72	3.00	0	
3/8/2006	7.0	0.85	5.00	9	0	1	0	0	20	147	6.13	1	8.20
3/9/2006	7.0	0.40	2.50	5	1	0	0	0	1	87	3.63	0	-24.40
4/2/2006	1.5	0.80	1.50	4.5	1	0	0	0	24	79.5	3.31	0	
4/6/2006	6.5	0.40	3.00	6	0	1	0	0	4	102	4.25	0	
5/10/2006	14.0	0.75	2.50	5	1	0	0	0	34	87	3.63	0	
5/24/2006	1.5	0.50	2.00	4	1	0	0	0	14	72	3.00	0	
6/1/2006	3.0	1.30	2.00	6	0	1	0	0	8	102	4.25	0	
6/10/2006	4.5	1.05	2.25	4	1	0	0	0	9	72	3.00	0	
6/22/2006	3.5	0.50	1.00	1	1	0	0	0	12	27	1.13	0	
7/13/2006	4.0	1.20	4.00	20	0	0	1	0	21	312	13.00	1	11.20
7/19/2006	1.0	0.85	16.00	5	1	0	0	0	6	87	3.63	1	13.80
7/21/2006	0.8	0.60	1.00	7	0	1	0	0	2	117	4.88	0	-10.40
8/10/2006	5.5	1.15	4.00	14	0	0	1	0	20	222	9.25	1	2.00
8/18/2006	2.0	0.75	2.50	9	0	1	0	0	8	147	6.13	0	-1.00
8/26/2006	2.5	0.45	2.50	6	0	1	0	0	8	102	4.25	0	
9/11/2006	4.5	0.50	2.50	3.5	1	0	0	0	16	64.5	2.69	0	
9/17/2006	6.0	1.35	3.00	15	0	0	1	0	6	202	11.75	0	
10/16/2006	14.0	2.10	8.00	32	0	0	0	1	29	492	20.50	1	15.20
10/27/2006	9.5	0.90	3.50	3.5	1	0	0	0	11	64.5	2.69	0	-10.90
11/15/2006	15.0	1.25	5.50	13	0	0	1	0	19	207	8.63	0	
11/30/2006	32.0	3.45	9.00	13.5	0	0	1	0	15	214.5	8.94	0	
1/4/2007	8.5	0.45	3.00	3.5	1	0	0	0	35	64.5	2.7	0	
1/12/2007	21.0	1.75	12.00	12	0	0	1	0	8	192	8.0	1	9.60
1/14/2007	11.0	0.80	2.00	2.5	1	0	0	0	2	49.5	2.1	0	-33.50
2/12/2007	8.5	0.80	2.50	1.83	1	0	0	0	29	39.45	1.6	0	
2/24/2007	8.5	1.25	6.00	15.5	0	0	1	0	12	244.5	10.2	0	
3/14/2007	7.0	0.60	2.50	1.4	1	0	0	0	18	33	1.4	0	
3/19/2007	0.5	0.40	1.50	0.8	1	0	0	0	5	24	1.0	0	
3/23/2007	3.0	0.30	1.25	0.42	1	0	0	0	4	18.3	0.8	0	
3/30/2007	8.5	0.70	4.25	1.5	1	0	0	0	7	34.5	1.4	1	0.70
3/31/2007	6.0	0.75	2.50	0.73	1	0	0	0	1	22.95	1.0		
				Total	82	32	24	12					
				Percentage	54.7%	21.3%	16.0%	8.0%					

(Pink) Indicates the presumed occurance of a CSO event occuring if this option were implemented

(Blue) Indicates that the storage ponds would not be emptied before another wet weather event producing even more CSO volume needed to be stored in the ponds occurred

Avg. Days Btwn Events
13
Median - Days Btwn Events
10.000
Mode - Days Btwn Events
1

Major Assumptions:

Average time to return to average flow after ra	12 hr
Average capacity of plant to receive CSO Flow	1.6 mgd
	66667 gph

*Assumes WWTP is the limiting factor in returning flow stored in the ponds.

Obviously, this flow rate exceeds the hydraulic capacity of the conceptual design proposed above. However, this estimate of average runoff rate relies on the estimates of CSO duration and total CSO discharge, made by WWTP staff, as the flow meter installed as part of this LTCP has yet to operate as intended. If this **Option IV.A.** is implemented as part of the City's LTCP, it is advisable that stormwater modeling be completed for both the City of Wood River, as well as the BP Amoco Facility, in order to get a more accurate picture of the peak runoff rates for various storm events. Obviously, if the peak runoff rate from these two facilities during the design storm event will exceed the 20,000 gpm capacity of the 72" gravity sewer, this would not be a feasible option.

One option is available to increase the amount of flow that can be directed to the storage ponds that is compatible with the proposed design. This option is to utilize the existing Levee District Pump Station pumps to transport high flow rates to the BP Amoco storage ponds (the use of the Levee District Pump Station for this purpose is being discussed as a part of this LTCP as a feasibly option; however, due to time constraints, no discussions with the Levee District have been initiated at this time).

This could easily be achievable with the proposed design (as seen in **Appendix GG**) by allowing Wood River CSO flows to bypass the proposed CSO diversion structure once CSO flow rates exceeded 13,333 gpm, proceeding to the Levee District Pump Station forebay. From here, the Wood River CSO flows along with the WWTP effluent could then be pumped to the 84" outfall sewer. A new diversion structure and approximately 200 foot sewer to direct these flows to the storage ponds would need to be constructed. Although it is not desirable to include the WWTP effluent in the flows directed to the storage ponds, effectively double treating this water, the actual volume which is expected to be diverted to the ponds for 2/3 of all CSO events would be 1.4 MG or less. This is calculated assuming the WWTP is treating the peak flow rate of 9.8 mgd over the average CSO duration of 3.5 hours.

Use of the Levee District Pump Station to pump flows once they have exceeded 13,333 gpm to the storage ponds would allow the 72" BP Amoco sewer to be solely dedicated to BP Amoco flows, while the capacity to divert Wood River CSO flows to the storage ponds would equal the 117,000 gpm reported capacity of the Levee District Pump Station.

All supporting hydraulic calculations for this conceptual design can be found in **Appendix GG**.

Analysis of Returning Flows to the WWTP from the BP Amoco Storage Ponds

In terms of the amount of time needed to allow for the return of such temporarily-stored Wood River combined sewage from BP's storage ponds back to the City's WWTP for treatment and eventual discharge to the Mississippi River, this becomes a function of three key considerations for any given wet weather event:

- the volume of combined sewage which that given wet weather event caused the City to store in BP's riverfront storage ponds.

and

- the length of time that elapses between the occurrence of a given wet weather event which causes the City to temporarily store excess combined sewage in BP's riverfront storage ponds, and the next wet weather event which will again cause the City to temporarily store excess combined sewage in BP's riverfront storage ponds (**because the current system is <u>not</u> configured to simultaneously store combined sewage in the ponds while returning stored combined sewage back to the WWTP, and could not cost-effectively be modified to do so**).

and

- the rate of flow at which the return of such temporarily-stored Wood River combined sewage from BP's storage ponds back to the City's WWTP can be accomplished (which is a function of <u>both</u> the capacity of the pumps used to return the stored flows, **and** the capacity of the City's WWTP to <u>both</u> continue to receive "normal" combined sewage flows <u>and</u> accept some quantity of "additional" volume of combined wastewater previously stored in the storage ponds).

Based on an evaluation and analysis of the historical records obtained from the City of Wood River regarding the frequency, intensity, and duration of wet weather events which had produced CSO discharges between January 2002 through March 2007, it was determined that during this time frame, 14 CSO events would have occurred, all during the month of September when it is assumed shutdown of the WWTP secondary treatment units would occur. Thus, 14 events occurring in 5.25 years, would in fact average out to approximately 3 CSO events per year. This analysis of the City of Wood River's CSO volumes and frequencies, along with the capacity of the WWTP to accept added capacity is shown in **Table 17.** It is important to note that the flows originating from BP Amoco were not taken into consideration during this analysis of capacity since they are unknown. However, assuming a total capacity of the BP Amoco storage ponds to be 150 MG, only in three instances was there less than 15.5 MG of additional storage capacity. These three instances all occurred within the same time frame in 2002, which seemed to be a wet year in comparison to the rest of the time frame analyzed.

As indicated in **Table 17**, this evaluation and analysis was based on an assumed average time of 12 hours after a wet weather event for wastewater flows to return to the average dry weather flow. This assumed average of 12 hours was based upon visual inspection of several flow charts during the time frame of known rain events. The analysis presented in **Table 17** was also based on a maximum flow rate (at which combined sewage previously-stored in BP's storage ponds could be returned to Wood River's WWTP for treatment and disposal) of 1.6 MGD. Based on discussions with the Wood River WWTP operating staff; it is believed that this 1.6 MGD assumption is a reasonable value.

Obviously, the quicker that previously-stored combined sewage flows can be removed from storage and returned to the WWTP for treatment and disposal, the lower is the probability that another wet weather event would occur that: a) precludes the ability to continue to return stored flow back to the WWTP, and b) begins "consuming" the ponds' storage volume again (rather than "restoring" some volume by returning stored flow back to the WWTP).

However, the difficulties, costs, and technical complexity of modifying and/or expanding the existing WWTP (so as to make that facility more capable of handling increased volumes of flow) are significant – as is explained in greater detail in the discussions regarding Option VIII.A. later in this Section VIII. of the LTCP.

Ultimately, it was determined that it was highly unlikely that implementation of only **Option IV.A.** alone would provide the necessary degree of certainty that the City of Wood River could consistently achieve compliance with Federal CSO Control Policy.

The basic unpredictability of the interval between potentially-CSO-producing wet weather events, the intensity of those events, the peak runoff rate of those events, and the duration of those events – coupled with the somewhat limited capability to return temporarily-stored flow back to the WWTP (as well as the limited "extra" capacity of the WWTP to accept those "additional" returned flows while continuing to treat "normal" combined sewage flow generated by the City of Wood River) – strongly suggested that (because of the relatively high volume of stormwater runoff that can result from a significant wet weather event – as much as 20 million gallons over an approximately 3.5 hour period) **any further evaluation of some form of Option IV.A. made sense only in combination with a CSO control Option which would increase the City's ability to accept significantly greater volumes of combined sewage which had been temporarily stored in BP's riverfront storage ponds and then returned to the City's WWTP for treatment – Option VIII.A.**

For this reason, further discussions of possible methods for implementing an operating scenario which could allow for use of the BP riverfront storage ponds by the City of Wood River for temporary storage of excess combined sewage (as well as estimates of construction costs associated with implementing such methods) were deferred to sub-Section E. of this Section VIII.

D. Option VII.B. CSO End-of-Pipe Alternate Disinfection Treatment System and Option VII.A. CSO End-of-Pipe Swirl / Vortex Treatment System

The suitability of **Options VII.A.** and **VII.B.** for inclusion as part of this CSO LTCP was sufficiently indicated by the Stage 1 initial screening / ranking of CSO control alternatives, and the Stage 2 preliminary evaluation of alternatives, to warrant a combination of these two Options being further evaluated in this Section VIII.

As discussed in Section V. of this LTCP, **Option VII.A.** is only feasible for use in the Wood River CSO LTCP as a precursor (or pretreatment) step to **Option VII.B.**. This is because the contaminant removed through application of the swirl / vortex treatment technology to combined wastewater flows is suspended solids. Given the normally high suspended solids concentration in the receiving stream for Wood River's CSO discharges (the Mississippi River), the suspended solids contained in such CSO discharges does not pose an environmental risk. However, as stated in

Section IV. of this LTCP, the area of the Mississippi River where Wood River's CSO's discharge is considered a "sensitive area", due to whole body contact recreational uses and nearby drinking water intakes.

For this reason, the UV disinfection technology provided by **Option VII.B.** does appear to warrant more serious consideration as a CSO Control Option, for use to minimize the viable pathogenic organism concentration in Wood River's CSO discharges. In applying UV disinfection technology to combined wastewater, though, the concentration of suspended solids present in that combined wastewater is a significant possible factor that could substantially reduce the treatment effectiveness of the UV disinfection CSO treatment technology. It is for this reason, that the combination of **Options VII.B.** and **VII.A.** was further evaluated for possible inclusion in Wood River's CSO LTCP; based on the conceptual schematic arrangement indicated on **Figure 14**, on the following page.

Unfortunately, in the relatively early stages of the evaluation of the feasibility of applying the combined **Options VII.B.** and **VII.A.** to Wood River's specific circumstances, it was determined (because of the relatively high concentrations of total suspended solids found in the Wood river CSO discharges which were finally able to be sampled and analyzed) that the swirl / vortex treatment technology of Option VII.A. was NOT capable of providing the level of performance for TSS removal that would make Wood River's CSO discharges suitable for cost-effective UV disinfection.

For this reason, further evaluation of end-of-pipe CSO discharge treatment using combined Options VII.B. and VII.A. as part of Wood River's CSO LTCP was terminated. However, it was judged that UV disinfection was still worthy of consideration – but only as a possible element of an Option of modifying Wood River's existing WWTP's equipment to increase capacity and/or treatment capability – **Option VIII.A.**

E. Option VIII.A. Modify Existing WWTP Equipment to Increase Treatment Capacity

The initial investigation / evaluation of this Option disclosed several major concerns about / impediments to the implementation of ANY approach for modifying the City's existing WWTP equipment, in order to increase treatment capacity (and thus reduce the frequency of untreated CSO discharges), including:

1. the "key" to the City's existing WWTP providing adequate levels of treatment is the secondary treatment train of the WWTP, and the current WWTP has only one aeration tank and one secondary clarifier. **This situation would very obviously make the task of modifying the existing secondary treatment equipment, while continuing to operate the WWTP in a manner that allows the WWTP to meet its NPDES effluent permit limits, extremely difficult and costly.**

2. the apparent optimal means of increasing the treatment capacity of the existing aeration tank (the critical part of the WWTP's activated sludge treatment process) would involve the installation of either some sort of fixed-film media or membranes in the existing aeration tank.
Such an installation would require the complete replacement of the existing combined diffused air / mechanical aeration equipment (currently being used to provide oxygen and mixing for the activated sludge process) with a fine-bubble diffused air system – at considerable expense and treatment system down time.

3. the basic concept of making a substantial capital investment to increase the "permanent" treatment capacity of the existing WWTP (and then operating that larger, more complex WWTP every day thereafter), just so that the City could intermittently treat some arbitrarily-selected additional amount of the substantial additional combined wastewater quantity which flows to the WWTP during occasional wet weather events, does NOT seem to offer a very sound alternative, economically.

Obviously, these concerns / considerations provide a stark contrast to the initial, promising evaluation of this Option, as presented in Section V. of this LTCP; but this is precisely the reason for performing more detailed evaluation of Options prior to making a final recommendation. It is not uncommon for the more in-depth evaluation of an alternative to reveal "flaws" in the original concept, which are sufficiently significant to warrant a drastic change in the previously-held opinion of the feasibility of that Option for the given particular circumstances of a specific project.

In any event, based on the "flaws" described above, it quickly became apparent that the "conversion" of **Option VIII.A.** (from an approach that would have involved modifying the existing WWTP, to an approach that would involve supplementing the treatment capacity of the existing WWTP equipment, with new technologies / processes) made eminently more sense for the in-depth evaluation of the concept of modifying the existing WWTP equipment to increase treatment capacity.

At the present time, there are a number of available technologies successfully in use (in the U.S., and around the world) for specifically treating wet weather-generated wastewater flows (both combined and separate); and then safely discharging those treated effluents (either alone, or following blending with higher-quality effluent from nearby more-complex, conventional wastewater treatment facilities) into receiving waters – without adverse environmental impact.

The major such available technologies include:

- racks, screens, porous media, rotating drums, and other solely physical separation contaminant-removal systems.

- continuous deflective separation (CDS), vortex separators, and other mechanically-assisted physical contaminant-removal systems.

- ➢ high rate clarification and other chemically- and/or mechanically-enhanced physical / chemical contaminant-removal systems.

- ➢ low-impact, minimal-operation physical / biological contaminant-removal systems; primarily man-made (constructed) wetlands.

Considering the specific circumstances, constraints, and needs of the City of Wood River, the "field" of technologies which are feasible for application by Wood River in their LTCP can quickly be narrowed, considering the following significant factors:

- o grossly insufficient amount of available land near the WWTP, for the acreage needed to construct an adequate wetlands treatment system.

- o as previously indicated, swirl / vortex / CDS systems are incapable of consistently providing the level of treatment performance that would be needed for Wood River's CSO discharge quality.

- o if swirl / vortex / CDS systems are incapable of consistently providing the level of treatment performance that would be needed for Wood River's CSO discharge quality, then the lesser-capable solely physical technologies obviously cannot be suitable.

This leaves only some form of high rate clarification (HRC) as a reasonable wet weather treatment technology for evaluation for use as part of Wood River's CSO LTCP. Fortunately, the key characteristics of one example of this type of technology -- ballasted high rate clarification (or flocculation), or BHRC – matches up quite well with the specific circumstances, constraints, and needs of the City of Wood River.

Figure 14, on the following page, is a schematic diagram of one manufacturer's ("ACTIFLO" by Kruger, Inc.) approach to BHRC.

Ballasted high rate clarification has the following very significant advantages, relative to its potential use as a wet weather treatment system by the City of Wood River:

1. capable of providing a high level of contaminant removal:

   Anticipated range of TSS removal efficiency = 80 to 90 %
   Anticipated range of BOD removal efficiency = 50 to 70 %
   Anticipated range of NH3-N removal efficiency = 20 to 30 %
   Anticipated range of Total P removal efficiency = 80 to 90 %
   Anticipated range of FO&G removal efficiency = 50 to 70 %
   Anticipated range of Fecal Coli. removal efficiency = 80 to 90 %

2. requires a fraction (potentially as low as 1/10) of the space needed by conventional wastewater treatment systems to obtain similar removals.

3. <u>very</u> tolerant of intermittent operation, with rapid "build-up" to peak treatment performance following "cold" start-up.

4. relatively simple to operate, and quite capable of automated operation

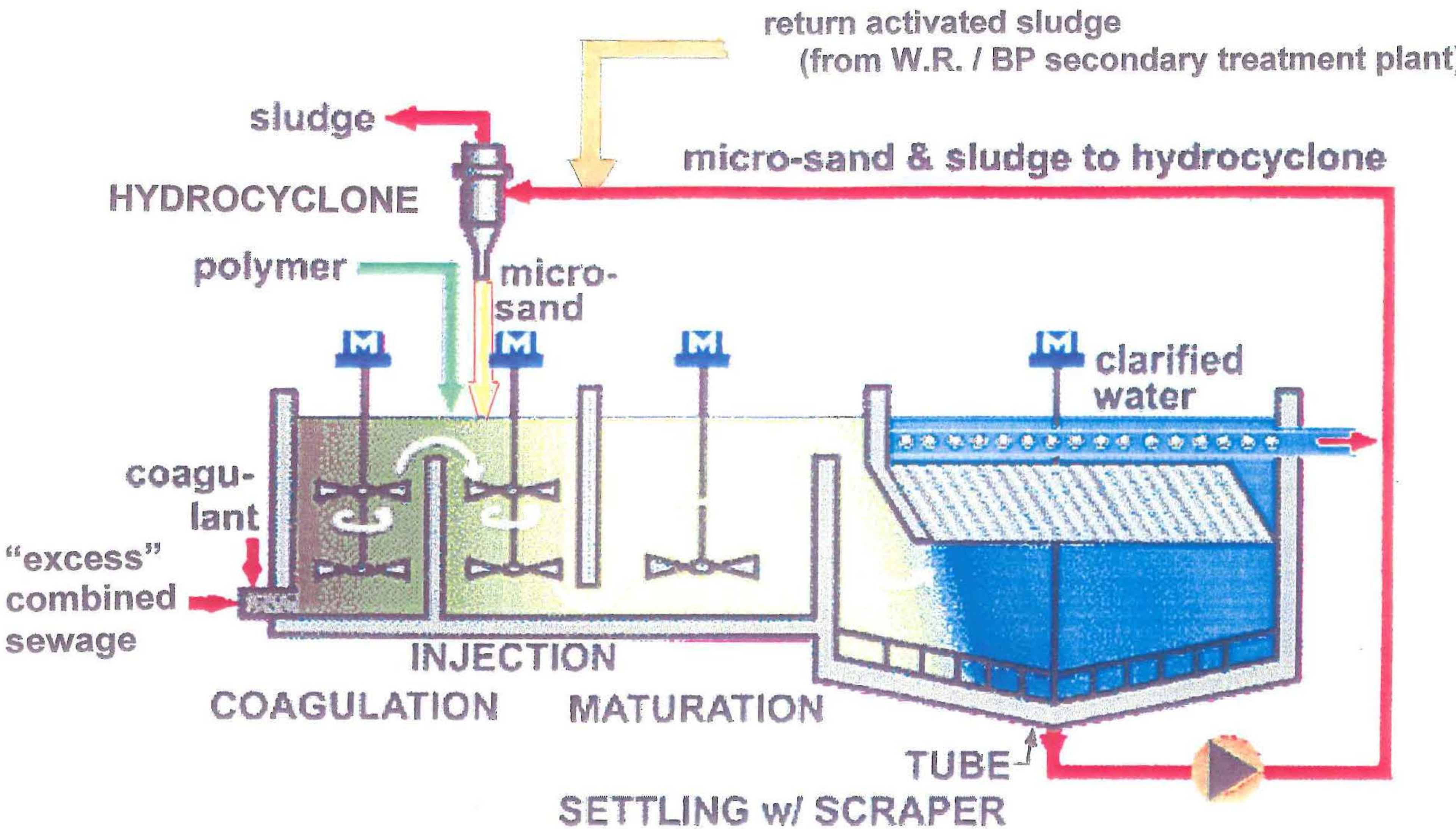


FIGURE 14 – ***SCHEMATIC OF BALLASTED HIGH RATE CLARIFICATION PROCESS***

Based on the evaluation of the historical records of the City of Wood River regarding the frequency, intensity, and duration of wet weather events which had produced CSO discharges due to excess (greater than the capacity of the City's WWTP) wet weather combined sewage volumes from January 2002 through March 2007 (refer to **Table 17,** previously introduced and discussed under **Option IV.A.**); it was determined that roughly 2/3 of the wet weather events during that period produced a total CSO quantity less than or equal to 7 Million Gallons (MG). It was further determined that the average duration of the CSO events during the January 2002 though March 2007 period was 3.5 hours (or 210 minutes).

On that basis, a BHRC wet weather treatment system was sized which would be expected to be capable of successfully treating an average combined wastewater flowrate of 33,000 gpm (7,000,000 gallons / 210 minutes). Such a system could also be expected to handle a maximum combined wastewater flowrate of 49,500 gpm (which, at the average duration of 210 minutes would equate to a total CSO quantity of 10.4 MG). Reference back to **Table 17** discloses that approximately 90 percent of the time (during the January 2002 through March 2007 period examined) Wood River's total CSO discharge volume was less than or equal to 10 MG.

In the course of developing a construction cost estimate for a 33,000 gpm BHRC wet weather treatment system for "insertion" into Wood River's existing combined sewage conveyance and treatment system (refer to the BHRC system sizing shown in **Table 18**, on the following page) it was rather quickly determined that (because of the relatively high volume of stormwater runoff that can result from a significant wet weather event) the concept of using <u>solely</u> BHRC as a CSO control option (for "on-demand" treatment of excess combined sewage flows) was simply infeasible – due to the exorbitant capital investment which would be required to pump and treat such large quantities of excess combined sewage during a relatively brief period.

One alternative to attempting to implement **Option VIII.A.** as a "stand-alone" CSO Control option would be to combine **Option VIII.A.** with **Option IV.A.** (as previously explained, and suggested for further consideration, in the earlier discussions of **Option IV.A.** presented in sub-Section C. of this Section VIII.).

This combined Option concept was effectively based on the principle of using **Option VIII.A.** as the "primary" CSO control measure; with **Option IV.A.** serving as a "secondary" CSO control measure (or possibly not being used at all, depending on how large a BHRC treatment facility the City were to construct).

Figure 15, on the following page, illustrates the proposed modifications to the various facilities of the City of Wood River, BP Amoco, and the Wood River Drainage & Levee District, which would appear to be necessary, in order to cost-effectively implement a combination of **Option IV.A.** and **VIII.A.** that could "work" for all three of these entities AND serve as a very effective CSO long term control option for the City of Wood River.

These basic modifications are necessary, in order to implement <u>any</u> scheme for temporarily storing in, and then eventually returning for treatment from, the BP Amoco riverfront storage ponds any quantity of excess combined sewage generated from the City of Wood River during significant wet weather events.

Table 18 Ballasted High Rate Clarification (BHRC) Wet Weather Flow Treatment System Sizing

Assumed Design Criteria:

Settling Tank Hydraulic Loading Rate (@ **Ave. Flow**) =		**30 gpm per sq. ft.**
Settling Tank Hydraulic Loading Rate (@ **Max. Flow**) =		**45 gpm per sq. ft.**
Assumed Influent **TSS** Concentration:	185 mg/l	
"Target" **TSS** Removal Efficiency:	85%	
"Target" Effluent **TSS** Concentration:	30 mg/l	
Assumed Influent **BOD** Concentration:	60 mg/l	
"Target" **BOD** Removal Efficiency:	50%	
"Target" Effluent **BOD** Concentration:	30 mg/l	
Assumed Influent **NH_3-N** Concentration:	1.2 mg/l	
"Target" **NH_3-N** Removal Efficiency:	20%	
Assumed Effluent **NH_3-N** Concentration:	1.0 mg/l	
Assumed Influent **P** Concentration:	0.7 mg/l	
"Target" **P** Removal Efficiency:	70%	
"Target" Effluent **P** Concentration:	0.2 mg/l	
Assumed Influent **Fecal Coli.** Conc.:	160,000	CFU / 100 ml
"Target" **Fecal Coli.** Removal Efficiency:	80%	
"Target" Effluent **Fecal Coli.** Conc.:	32,000	CFU / 100 ml

Clarification-Enhancing Additive Dosages:

Microsand	3000 mg/l
Ferric Chloride	100 mg/l
Anionic Polymer	2 mg/l
Return Activ. Sludge	500 mg/l

System Sizing:

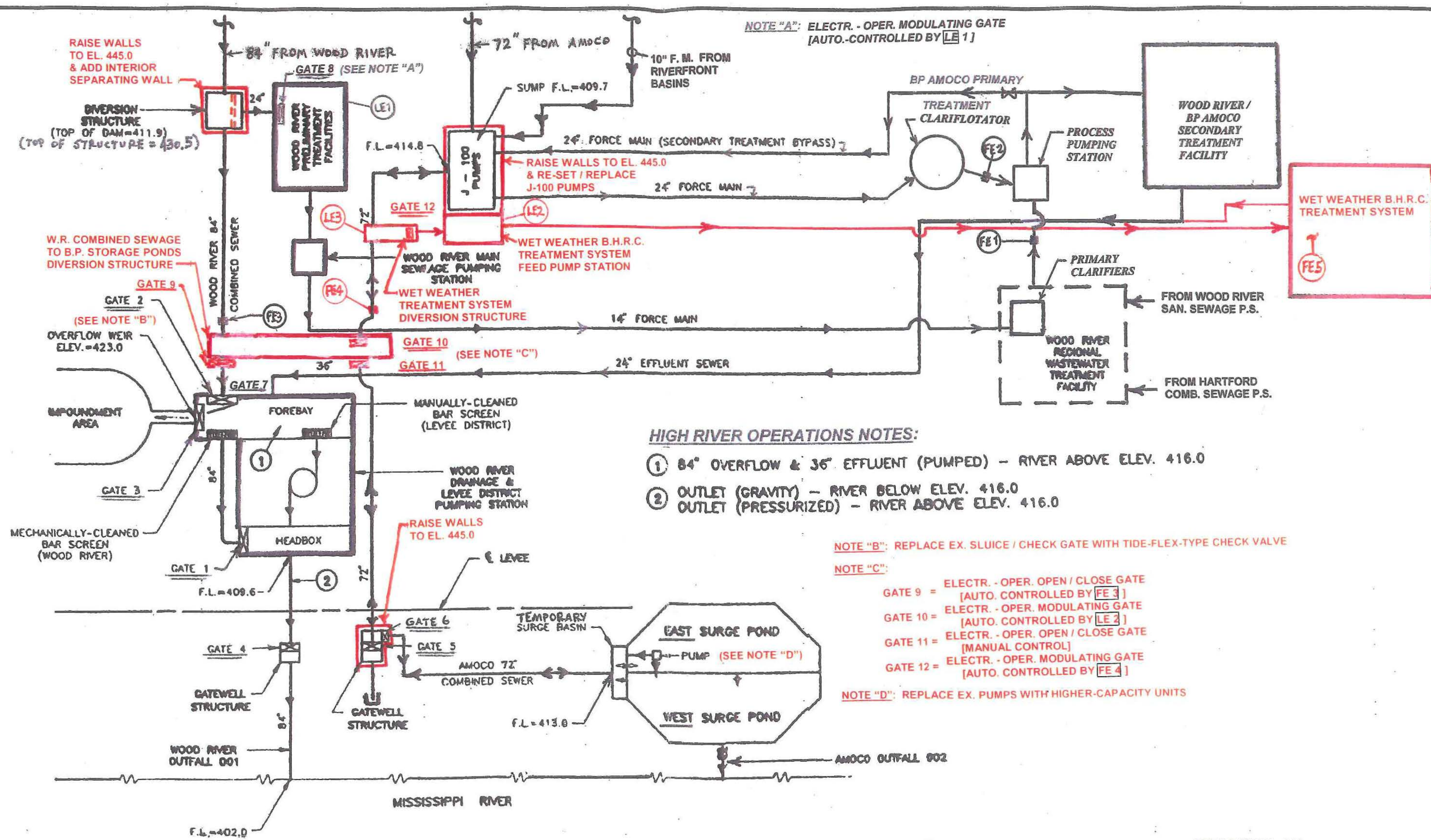
Based on the summary of historical CSO discharge volumes and other data presented in Table 21, on the following page, roughly 2/3 of the time Wood River's wet weather events produce **total CSO discharge** volumes less than **7 million gallons** AND the **average duration** of a Wood River CSO discharge is **3.5 hrs. (or 210 minutes)**, for the period from January 2002 through March 2007.

So, one possible scenario would suggest an **HRC wet weather treatment system design "ave." flow = 33,000 gpm.**

At the design hydraulic loading rate, the settling tank component of that BHRC system would then be 33,300 gpm / 30 gpm per sq. ft. = **1,100 sq. ft.** (or 33 ft x 33 ft.).

Such a system would be capable of handling a **maximum CSO flow volume** of 1,100 sq. ft. x 45 gpm per sq. ft., or **49,500 gpm** (which, at the average wet weather event duration of 210 minutes) would equate to a maximum total CSO discharge treatment capacity of **10.4 million gallons**.

By: **Horner & Shifrin, Inc.**
May 4, 2007



***PROPOSED* OVERALL COMBINED SEWAGE TREATMENT / DISCHARGE SCHEMATIC**

NO SCALE

FIGURE 15

WOOD RIVER, ILLINOIS CSO LTCP

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For this reason, as well as because ANY wastewater treatment system will operate significantly more efficiently when it receives a consistent quantity and quality of influent flow, it was determined that further evaluation of BHRC (**Option VIII.A.**) for Wood River's LTCP only made sense based on its evaluation in combination with **Option IV.A.** (Wood River's use of BP Amoco's storage ponds for temporary storage of excess combined wastewater during wet weather events).

Furthermore, given that the very high cost involved makes a relatively large, "on-demand" BHRC wet weather treatment system infeasible, the focus of this detailed evaluation was shifted to a combined approach for CSO control which still jointly employed **Option IV.A.** and **Option VIII.A.; but** in a way that made **Option IV.A.** the "primary" control measure and **Option VIII.A.** the "secondary" control measure.

By using BP Amoco's riverfront storage ponds as a combined sewage flow "equalization basin" for the City's excess combined sewage generated during wet weather events, the necessary design flowrate for which the BHRC wet weather treatment system must be designed, can be reduced dramatically.

Once again the evaluation methods which formed the basis for **Table 17** (introduced in the earlier discussion of **Option IV.A.** in sub-Section C. of this Section VIII.), were used to determine the "optimum" capacity for a new wet weather treatment system (entirely separate from the existing Wood River WWTP) that could be constructed, in order to reduce the length of time needed to return flows previously stored in the BP riverfront storage ponds back to the wastewater treatment / disposal system.

As previously indicated, the quicker that previously-stored combined sewage flows can be removed from storage and returned to the WWTP for treatment and disposal, the lower is the probability that another wet weather event would occur that could conceivably lead to a CSO occurrence (if there was insufficient available treatment capacity to treat / dispose of, or insufficient available storage pond volume to store, the excess combined sewage flow generated by that wet weather event).

Owing to the lingering uncertainty regarding the critical question regarding BP Amoco's determination of the quantity of runoff from its Wood River facilities which BP must convey to (and store in) BP's riverfront storage ponds, it was decided to determine the "optimum" capacity for a new wet weather treatment system (entirely separate from the existing Wood River WWTP) that could be constructed, in order to reduce the length of time needed to return flows previously stored in the BP riverfront storage ponds back to the wastewater treatment / disposal system by assuming that BP Amoco's stored combined wastewater would be exclusively returned to (and treated by) whatever capacity was "available" in Wood River's existing WWTP (previously indicated in sub-Section C. of this Section VIII., under the discussion of Option IV.A.) to be approximately 1.6 MGD.

This is believed to be a very reasonable assumption because: a) it basically "divorces" the still-unknown BP stormwater contribution to the BP riverfront storage ponds during wet weather from the analysis of the storage of Wood River combined sewage in the BP riverfront storage ponds; and b) it exactly "preserves" the current status quo for the return of BP wastewater previously-stored in BP's riverfront storage ponds back to the City's WWTP for treatment and disposal (which has been successfully practiced for a number of years).

The previously-presented **Table 17** was based on the assumption that flow previously stored in BP's riverfront storage ponds could be returned to the City's existing WWTP at a flowrate no greater than **1.6 MGD**. This assumption resulted in a projection that (based on historical records for rainfall, combined sewage flows, and CSO discharge volumes and durations over the period 2002 to 2006) there might be **46 instances** when a wet weather event occurred before previously-stored events' flows could be "cleared" from the storage ponds.

Such instances could conceivably result in a CSO discharge, so even 46 instances over 4 years (although representing a dramatic improvement compared to the 150 CSO discharges which actually occurred during that 4-year period) would be problematic.

So, **Table 17-A** was prepared using the assumption that flow previously stored in BP's riverfront storage ponds could be returned to the City's existing WWTP at a flowrate of **8 MGD**. This assumption resulted in a projection that (based on historical records for rainfall, combined sewage flows, and CSO discharge volumes and durations over the period 2002 to 2006) there might be only **12 instances** when a wet weather event occurred before previously-stored events' flows could be "cleared" from the storage ponds.

Lastly, **Table 17-B** was prepared using the assumption that flow previously stored in BP's riverfront storage ponds could be returned to the City's existing WWTP at a flowrate of **16 MGD**. This assumption resulted in a projection that (based on historical records for rainfall, combined sewage flows, and CSO discharge volumes and durations over the period 2002 to 2006) there might be only **8 instances** when a wet weather event occurred before previously-stored events' flows could be "cleared" from the storage ponds.

Given the above results, it is apparent that the most reduction in CSO discharge potential for the least cost is offered by the concept of installing an 8 MGD-capacity BHRC wet weather treatment system.

The previously-presented **Figure 15**, along with **Figure 16**, on the following page, schematically illustrate the proposed modifications to the various facilities of the City of Wood River, BP Amoco, and the Wood River Drainage & Levee District, which appear to be necessary, in order to cost-effectively implement a combination of **Option IV.A.** and **Option VIII.A.**

Table 17-A Wood River CSO Discharge Volume and Frequency, Storage Pond Capacity, and WWTP Capacity Evaluation (January 2002 through March 2007)

Event Date	Event Duration (hr)	Estimated Rainfall (in)	Estimated Duration of CSO Discharge (hr)	Estimated Amount Discharged (mg)	CSO Events Sorted by Estimated Volume Discharged (x, MG) x<=5	5<x<=10	10<x<=20	x>20	Days Between CSO Discharge Events	Estimated Amount of Time Required to Return Stored Flow to WWTP* (hr)	Estimated Amount of Time Required to Return Stored Flow to WWTP* (days)	Does CSO Occur Before Previously Stored Volume Has Been Treated?	Capacity of Storage Ponds Being Consumed
1/29/2002	21.0	2.2	4.5	4	1	0	0	0		24	1.00	0	
2/19/2002	21.5	0.7	2	4	1	0	0	0	21	24	1.00	0	
3/2/2002	5.0	0.45	9	12	0	0	1	0	11	48	2.00	0	
3/15/2002	4.0	0.55	2	3	1	0	0	0	13	21	0.88	0	
3/28/2002	1.0	0.05	1	1	1	0	0	0	13	15	0.63	0	
4/7/2002	17.5	0.8	1	2	1	0	0	0	10	18	0.75	0	
4/19/2002	6.0	1.4	4	10	0	1	0	0	12	42	1.75	0	
4/21/2002	1.0	0.15	1	1	1	0	0	0	2	15	0.63	0	
4/27/2002	6.5	1.1	4.2	10	0	1	0	0	6	42	1.75	0	
5/6/2002	8.5	0.65	2.5	18	0	0	1	0	9	66	2.75	1	14.00
5/7/2002	6.5	2.85	3.5	32	0	0	0	1	1	108	4.50	0	10.00
5/12/2002	16.5	4.4	16	82	0	0	0	1	5	258	10.75	1	64.00
5/16/2002	3.8	0.4	2.25	16	0	0	1	0	4	60	2.50	1	76.00
5/17/2002	8.5	0.8	5	35	0	0	0	1	1	117	4.88	0	-37.00
6/5/2002	3.0	0.40	1.25	4	1	0	0	0	19	24	1.00	0	
6/10/2002	3.0	0.90	3.00	6	0	1	0	0	5	30	1.25	1	2.00
6/11/2002	0.8	1.75	2.25	12	0	0	1	0	1	48	2.00	0	-94.00
6/25/2002	2.0	0.30	1.25	5	1	0	0	0	14	27	1.13	0	
7/26/2002	2.3	0.33	2.25	6	0	1	0	0	31	30	1.25	0	
8/11/2002	5.0	2.05	2.50	4	1	0	0	0	16	24	1.00	0	
8/16/2002	1.0	0.50	1.00	4	1	0	0	0	5	24	1.00	0	
8/18/2002	3.5	0.75	4.00	4	1	0	0	0	2	24	1.00	0	
8/19/2002	1.5	1.25	1.00	7	0	1	0	0	1	33	1.38	0	
8/23/2002	2.0	0.35	1.00	4	1	0	0	0	4	24	1.00	0	
9/17/2002	5.5	0.60	2.75	5	1	0	0	0	25	27	1.13		
9/19/2002	2.8	1.40	4.00	4	1	0	0	0	2	24	1.00		
9/20/2002	7.0	0.40	1.75	0	1	0	0	0	1	12	0.50		
10/4/2002	4.3	0.25	1.50	1	1	0	0	0	14	15	0.63	0	
10/6/2002	3.5	0.35	2.00	1	1	0	0	0	2	15	0.63	0	
10/25/2002	6.5	0.80	3.00	2	1	0	0	0	19	18	0.75	0	
11/5/2002	3.0	0.45	2.00	2	1	0	0	0	11	18	0.75	0	
12/18/2002	13.5	1.10	1.50	1	1	0	0	0	43	15	0.63	0	
2/14/2003	6.0	0.35	2.50	4	1	0	0	0	58	24	1.00	0	
2/18/2003	0.5		1.00	1	1	0	0	0	4	15	0.63	0	
3/13/2003	2.0	0.60	1.25	1	1	0	0	0	23	15	0.63	0	
3/19/2003	3.8	0.45	2.75	3	1	0	0	0	6	21	0.88	0	
3/20/2003	0.1	0.10	0.90	1	1	0	0	0	1	15	0.63	0	
3/28/2003	7.0	0.30	3.00	6	0	1	0	0	8	30	1.25	0	
4/4/2003	1.0	0.35	2.00	3	1	0	0	0	7	21	0.88	0	
4/20/2003	2.5	0.75	2.50	3	1	0	0	0	16	21	0.88	0	
4/24/2003	6.0	0.70	4.00	4	1	0	0	0	4	24	1.00	0	
4/25/2003	4.0	0.60	4.00	6	0	1	0	0	1	30	1.25	0	
4/28/2003	1.8	0.30	2.25	3	1	0	0	0	3	21	0.88	0	
5/4/2003	8.0	1.20	3.50	5	1	0	0	0	6	27	1.13	0	
5/8/2003	3.0	0.30	2.50	5	1	0	0	0	4	27	1.13	0	
5/10/2003	3.0	1.15	2.50	10	0	1	0	0	2	42	1.75	0	
5/30/2003	2.0	0.45	1.00	1	1	0	0	0	20	15	0.63	0	
6/10/2003	2.5	0.65	3.00		1	0	0	0	11	12	0.50	0	
6/12/2003	2.5	1.45	2.00		1	0	0	0	2	12	0.50	0	
6/26/2003	8.0	3.45	7.00	43	0	0	0	1	14	141	5.88	0	
7/18/2003	5.5	1.25	2.00	4	1	0	0	0	22	24	1.00	0	
7/28/2003	1.5	0.38	1.00	1	1	0	0	0	10	15	0.63	0	
9/1/2003	7.5	1.85	5.00	15	0	0	1	0	35	57	2.38	0	
9/26/2003	3.0	0.85	1.50	4	1	0	0	0	25	24	1.00	0	
10/9/2003	2.5	0.65	3.00	4	1	0	0	0	13	24	1.00	0	
11/1/2003	7.0	0.50	2.00	2	1	0	0	0	23	18	0.75	0	
11/17/2003	6.5	4.00	4.00	29	0	0	0	1	16	99	4.13	1	25.00
11/18/2003	0.5	0.05	2.50	7	0	1	0	0	1	33	1.38	0	-132.00
12/9/2003	0.5	0.15	1.00	1	1	0	0	0	21	15	0.63	0	
12/22/2003	11.0	0.95	6.00	6	0	1	0	0	13	30	1.25	0	
1/4/2004	13.5	2.55	4.25	14	0	0	1	0	13	54	2.25	0	
1/17/2004	20.0	0.70	1.00	2	1	0	0	0	13	18	0.75	0	
2/2/2004	6.0	0.70	2.50		1	0	0	0	16	12	0.50	0	
3/4/2004	7.0	1.55	5.00	9	0	1	0	0	31	39	1.63	0	
3/25/2004	4.0	0.35	2.50	3	1	0	0	0	21	21	0.88	0	
3/26/2004	4.0	1.25	3.00	5	1	0	0	0	1	27	1.13	0	
4/24/2004	10.5	1.20	5.00	6	0	1	0	0	29	30	1.25	0	
4/30/2004	1.5	1.60	2.00	14	0	0	1	0	6	54	2.25	0	
5/12/2004	2.0		1.00	1	1	0	0	0	12	15	0.63	0	
5/13/2004	21.0	3.20	20.00	17	0	0	1	0	1	63	2.63	0	
5/19/2004	5.0	0.85	3.50	4	1	0	0	0	6	24	1.00	0	
5/25/2004	6.0	0.90	4.25	7	0	1	0	0	6	33	1.38	1	3.00
5/26/2004	6.0	1.90	4.00	5	1	0	0	0	1	27	1.13	1	4.00
5/27/2004	4.5	0.75	6.00	17	0	0	1	0	1	63	2.63	0	1.00
5/30/2004	3.0	0.75	3.00	7	0	1	0	0	3	33	1.38	0	
6/9/2004	6.0	0.35	2.50	3	1	0	0	0	10	21	0.88	0	
6/15/2004	0.5	0.50	1.50	2	1	0	0	0	6	18	0.75	0	
6/16/2004	6.0	3.30	5.00	14	0	0	1	0	1	54	2.25	0	
7/6/2004	8.5	1.10	4.00	14	0	0	1	0	20	54	2.25	0	
7/30/2004	8.5	2.70	4.00	11	0	0	1	0	24	45	1.88	0	
8/4/2004	2.0	0.65	2.00	4	1	0	0	0	5	24	1.00	0	
8/23/2004	1.5	0.45	2.00	6	0	1	0	0	19	30	1.25	1	2.00
8/24/2004	3.3	0.50	1.50	4	1	0	0	0	1	24	1.00	0	2.00
8/25/2004	2.5	1.25	2.50	7	0	1	0	0	1	33	1.38	0	-155.00
9/15/2004	4.0	0.70	2.50	89	0	0	0	1	21	279	11.63	0	
10/12/2004	3.5	0.40	1.75	4	1	0	0	0	27	24	1.00	0	
10/14/2004	16.0	0.65	6.00	3	1	0	0	0	2	21	0.88	0	
10/18/2004	16.0	1.25	7.50	20	0	0	1	0	4	72	3.00	0	
10/26/2004	3.3	0.60	2.00	5	1	0	0	0	8	27	1.13	0	
12/6/2004	12.0	1.75	5.00	24	0	0	0	1	41	84	3.50	0	
1/2/2005	13.0	2.00	6.50	13	0	0	1	0	27	51	2.13	1	1.00
1/4/2005	24.0	2.65	16.00	30	0	0	0	1	2	102	4.25	1	27.00
1/5/2005	2.5	1.00	2.50	3	1	0	0	0	1	21	0.88	0	-22.00
1/12/2005	13.5	2.85	8.00	21	0	0	0	1	7	75	3.13	0	
2/7/2005	3.0	0.35	2.00	4	1	0	0	0	26	24	1.00	0	
2/13/2005	8.5	0.70	4.00	9	0	1	0	0	6	39	1.63	0	
3/22/2005	8.3	1.50	7.75	32	0	0	0	1	37	108	4.50	0	
6/8/2005	1.5	0.35	1.50	3	1	0	0	0	78	21	0.88	0	
6/13/2005	2.5	1.20	3.00	9	0	1	0	0	5	39	1.63	0	
6/25/2005	1.0	0.90	2.50	10	0	1	0	0	12	42	1.75	0	
7/11/2005	17.0	1.15	12.00	7	0	1	0	0	16	33	1.38	0	
15-Jul	2.0	1.00	2.00	10	0	1	0	0	4	42	1.75	0	
7/18/2005	1.5	0.60	2.00	9	0	1	0	0	3	39	1.63	0	
8/15/2005	12.0	2.25	8.00	50	0	0	0	1	28	162	6.75	0	
8/25/2005	1.5	1.00	2.00	9	0	1	0	0	10	39	1.63	1	5.00
8/26/2005	1.8	0.45	1.50	4	1	0	0	0	1	24	1.00	0	-11.00
8/29/2005	1.5	0.20	1.50	8	0	1	0	0	3	36	1.50	0	
9/14/2005	2.5	0.55	1.75	2	1	0	0	0	16	18	0.75	0	
9/15/2005	5.0	0.70	4.00	5	1	0	0	0	1	27	1.13	0	
9/19/2005	6.0	2.00	3.50	10	0	1	0	0	4	42	1.75	0	
9/25/2005	14.0	1.35	3.00	10	0	1	0	0	6	42	1.75	0	
9/28/2005	2.5	0.80	2.00	4	1	0	0	0	3	24	1.00	0	
10/20/2005	4.5	0.40	1.00	2	1	0	0	0	22	18	0.75	0	
10/31/2005	12.5	1.20	9.00	17	0	0	1	0	11	63	2.63	0	
11/14/2005	11.5	1.05	8.00	5	1	0	0	0	14	27	1.13	0	
11/27/2005	7.0	1.55	5.50	20	0	0	1	0	13	72	3.00	0	
1/10/2006	12.0	0.65	1.50	3	1	0	0	0	44	21	0.88	0	
1/28/2006	13.0	0.85	4.50	14	0	0	1	0	18	54	2.25	0	
2/16/2006	2.0	0.45	1.50	4	1	0	0	0	19	24	1.00	0	
3/8/2006	7.0	0.85	5.00	9	0	1	0	0	20	39	1.63	1	5.00
3/9/2006	7.0	0.40	2.50	5	1	0	0	0	1	27	1.13	0	-178.00
4/2/2006	1.5	0.80	1.50	4.5	1	0	0	0	24	25.5	1.06	0	
4/6/2006	6.5	0.40	3.00	6	0	1	0	0	4	30	1.25	0	
5/10/2006	14.0	0.75	2.50	5	1	0	0	0	34	27	1.13	0	
5/24/2006	1.5	0.50	2.00	4	1	0	0	0	14	24	1.00	0	
6/1/2006	3.0	1.30	2.00	6	0	1	0	0	8	30	1.25	0	
6/10/2006	4.5	1.05	2.25	4	1	0	0	0	9	24	1.00	0	
6/22/2006	3.5	0.50	1.00	1	1	0	0	0	12	15	0.63	0	
7/13/2006	4.0	1.20	4.00	20	0	0	1	0	21	72	3.00	0	
7/19/2006	1.0	0.85	16.00	5	1	0	0	0	6	27	1.13	0	
7/21/2006	0.8	0.60	1.00	7	0	1	0	0	2	33	1.38	0	
8/10/2006	5.5	1.15	4.00	14	0	0	1	0	20	54	2.25	0	
8/18/2006	2.0	0.75	2.50	9	0	1	0	0	8	39	1.63	0	
8/26/2006	2.5	0.45	2.50	6	0	1	0	0	8	30	1.25	0	
9/11/2006	4.5	0.50	2.50	3.5	1	0	0	0	16	22.5	0.94	0	
9/17/2006	6.0	1.35	3.00	18	0	0	1	0	6	66	2.75	0	
10/16/2006	14.0	2.10	8.00	32	0	0	0	1	29	108	4.50	0	
10/27/2006	9.5	0.90	3.50	3.5	1	0	0	0	11	22.5	0.94	0	
11/15/2006	15.0	1.25	5.50	13	0	0	1	0	19	51	2.13	0	
11/30/2006	32.0	3.45	9.00	13.5	0	0	1	0	15	52.5	2.19	0	
1/4/2007	8.5	0.45	3.00	3.5	1	0	0	0	35	22.5	0.9	0	
1/12/2007	21.0	1.75	12.00	12	0	0	1	0	8	48	2.0	0	
1/14/2007	11.0	0.80	2.00	2.5	1	0	0	0	2	19.5	0.8	0	
2/12/2007	8.5	0.80	2.50	1.83	1	0	0	0	29	17.49	0.7	0	
2/24/2007	8.5	1.25	6.00	15.5	0	0	1	0	12	58.5	2.4	0	
3/14/2007	7.0	0.60	2.50	1.4	1	0	0	0	18	16.2	0.7	0	
3/19/2007	0.5	0.40	1.50	0.8	1	0	0	0	5	14.4	0.6	0	
3/23/2007	3.0	0.30	1.25	0.42	1	0	0	0	4	13.26	0.6	0	
3/30/2007	8.5	0.70	4.25	1.5	1	0	0	0	7	16.5	0.7	0	
3/31/2007	6.0	0.75	2.50	0.73	1	0	0	0	1	14.19	0.6		
				Total	82	32	24	12					
				Percentage	54.7%	21.3%	16.0%	8.0%					

Indicates the presumed occurance of a CSO event occuring if this option were implemented

Indicates that the storage ponds would not be emptied before another wet weather event producing even more CSO volume needed to be stored in the ponds occurred

*Assumes WWTP is the limiting factor in returning flow stored in the ponds.

Avg. Days Btwn Events
13
Median - Days Btwn Events
10.000
Mode - Days Btwn Events
1

Major Assumptions:

Average time to return to average flow after ra	12 hr
Average capacity of plant to receive CSO Flow	8 mgd
	333333 gph

Table 17-B Wood River CSO Discharge Volume and Frequency, Storage Pond Capacity, and WWTP Capacity Evaluation (January 2002 through March 2007)

Event Date	Event Duration (hr)	Estimated Rainfall (in)	Estimated Duration of CSO Discharge (hr)	Estimated Amount Discharged (mg)	CSO Events Sorted by Estimated Volume Discharged (x, MG) x<=5	5<x<=10	10<x<=20	x>20	Days Between CSO Discharge Events	Estimated Amount of Time Required to Return Stored Flow to WWTP* (hr)	Estimated Amount of Time Required to Return Stored Flow to WWTP* (days)	Does CSO Occur Before Previously Stored Volume Has Been Treated?	Capacity of Storage Ponds Being Consumed
1/29/2002	21.0	2.2	4.5	4	1	0	0	0		18	0.75	0	
2/19/2002	21.5	0.7	2	4	1	0	0	0	21	18	0.75	0	
3/2/2002	5.0	0.45	9	12	0	0	1	0	11	30	1.25	0	
3/15/2002	4.0	0.55	2	3	1	0	0	0	13	16.5	0.69	0	
3/28/2002	1.0	0.05	1	1	1	0	0	0	13	13.5	0.56	0	
4/7/2002	17.5	0.8	1	2	1	0	0	0	10	15	0.63	0	
4/19/2002	6.0	1.4	4	10	0	1	0	0	12	27	1.13	0	
4/21/2002	1.0	0.15	1	1	1	0	0	0	2	13.5	0.56	0	
4/27/2002	6.5	1.1	4.2	10	0	1	0	0	6	27	1.13	0	
5/6/2002	8.5	0.65	2.5	18	0	0	1	0	9	39	1.63	1	10.00
5/7/2002	6.5	2.85	3.5	32	0	0	0	1	1	60	2.50	0	-30.00
5/12/2002	16.5	4.4	16	82	0	0	0	1	5	135	5.63	1	26.00
5/16/2002	3.8	0.4	2.25	16	0	0	1	0	4	36	1.50	1	34.00
5/17/2002	8.5	0.8	5	35	0	0	0	1	1	64.5	2.69	0	-227.00
6/5/2002	3.0	0.40	1.25	4	1	0	0	0	19	18	0.75	0	
6/10/2002	3.0	0.90	3.00	6	0	1	0	0	5	21	0.88	0	
6/11/2002	0.8	1.75	2.25	12	0	0	1	0	1	30	1.25	0	
6/25/2002	2.0	0.30	1.25	5	1	0	0	0	14	19.5	0.81	0	
7/26/2002	2.3	0.33	2.25	6	0	1	0	0	31	21	0.88	0	
8/11/2002	5.0	2.05	2.50	4	1	0	0	0	16	18	0.75	0	
8/16/2002	1.0	0.50	1.00	4	1	0	0	0	5	18	0.75	0	
8/18/2002	3.5	0.75	4.00	4	1	0	0	0	2	18	0.75	0	
8/19/2002	1.5	1.25	1.00	7	0	1	0	0	1	22.5	0.94	0	
8/23/2002	2.0	0.35	1.00	4	1	0	0	0	4	18	0.75	0	
9/17/2002	5.5	0.60	2.75	5	1	0	0	0	25	19.5	0.81		
9/19/2002	2.5	1.40	4.00	4	1	0	0	0	2	18	0.75		
9/20/2002	7.0	0.40	1.75	0	1	0	0	0	1	12	0.50		
10/4/2002	4.3	0.25	1.50	1	1	0	0	0	14	13.5	0.56	0	
10/6/2002	3.5	0.35	2.00	1	1	0	0	0	2	13.5	0.56	0	
10/25/2002	6.5	0.80	3.00	2	1	0	0	0	19	15	0.63	0	
11/5/2002	3.0	0.45	2.00	2	1	0	0	0	11	15	0.63	0	
12/18/2002	13.5	1.10	1.50	1	1	0	0	0	43	13.5	0.56	0	
2/14/2003	6.0	0.35	2.50	4	1	0	0	0	58	18	0.75	0	
2/18/2003	0.5		1.00	1	1	0	0	0	4	13.5	0.56	0	
3/13/2003	2.0	0.60	1.25	1	1	0	0	0	23	13.5	0.56	0	
3/19/2003	3.8	0.45	2.75	3	1	0	0	0	6	16.5	0.69	0	
3/20/2003	0.1	0.10	0.90	1	1	0	0	0	1	13.5	0.56	0	
3/28/2003	7.0	0.30	3.00	6	0	1	0	0	8	21	0.88	0	
4/4/2003	1.0	0.35	2.00	3	1	0	0	0	7	16.5	0.69	0	
4/20/2003	2.5	0.75	2.50	3	1	0	0	0	16	16.5	0.69	0	
4/24/2003	6.0	0.70	4.00	4	1	0	0	0	4	18	0.75	0	
4/25/2003	4.0	0.60	4.00	6	0	1	0	0	1	21	0.88	0	
4/28/2003	1.8	0.30	2.25	3	1	0	0	0	3	16.5	0.69	0	
5/4/2003	8.0	1.20	3.50	5	1	0	0	0	6	19.5	0.81	0	
5/8/2003	3.0	0.30	2.50	5	1	0	0	0	4	19.5	0.81	0	
5/10/2003	3.0	1.15	2.50	10	0	1	0	0	2	27	1.13	0	
5/30/2003	2.0	0.45	1.00	1	1	0	0	0	20	13.5	0.56	0	
6/10/2003	2.5	0.65	3.00		1	0	0	0	11	12	0.50	0	
6/12/2003	2.5	1.45	2.00		1	0	0	0	2	12	0.50	0	
6/26/2003	8.0	3.45	7.00	43	0	0	0	1	14	76.5	3.19	0	
7/18/2003	5.5	1.25	2.00	4	1	0	0	0	22	18	0.75	0	
7/28/2003	1.5	0.38	1.00	1	1	0	0	0	10	13.5	0.56	0	
9/1/2003	7.5	1.65	5.00	15	0	0	1	0	35	34.5	1.44	0	
9/26/2003	3.0	0.85	1.50	4	1	0	0	0	25	18	0.75	0	
10/9/2003	2.5	0.65	3.00	4	1	0	0	0	13	18	0.75	0	
11/1/2003	7.0	0.50	2.00	2	1	0	0	0	23	15	0.63	0	
11/17/2003	6.5	4.00	4.00	29	0	0	0	1	16	55.5	2.31	1	21.00
11/18/2003	0.5	0.05	2.50	7	0	1	0	0	1	22.5	0.94	0	-300.00
12/9/2003	0.5	0.15	1.00	1	1	0	0	0	21	13.5	0.56	0	
12/22/2003	11.0	0.95	6.00	6	0	1	0	0	13	21	0.88	0	
1/4/2004	13.5	2.55	4.25	14	0	0	1	0	13	33	1.38	0	
1/17/2004	20.0	0.70	1.00	2	1	0	0	0	13	15	0.63	0	
2/2/2004	6.0	0.70	2.50		1	0	0	0	16	12	0.50	0	
3/4/2004	7.0	1.55	5.00	9	0	1	0	0	31	25.5	1.06	0	
3/25/2004	4.0	0.35	2.50	3	1	0	0	0	21	16.5	0.69	0	
3/26/2004	4.0	1.25	3.00	5	1	0	0	0	1	19.5	0.81	0	
4/24/2004	10.5	1.20	5.00	6	0	1	0	0	29	21	0.88	0	
4/30/2004	1.5	1.60	2.00	14	0	0	1	0	6	33	1.38	0	
5/12/2004	2.0		1.00	1	1	0	0	0	12	13.5	0.56	0	
5/13/2004	21.0	3.20	20.00	17	0	0	1	0	1	37.5	1.56	0	
5/19/2004	5.0	0.85	3.50	4	1	0	0	0	6	18	0.75	0	
5/25/2004	6.0	0.90	4.25	7	0	1	0	0	6	22.5	0.94	0	
5/26/2004	6.0	1.90	4.00	5	1	0	0	0	1	19.5	0.81	0	
5/27/2004	4.5	0.75	6.00	17	0	0	1	0	1	37.5	1.56	0	
5/30/2004	3.0	0.75	3.00	7	0	1	0	0	3	22.5	0.94	0	
6/9/2004	6.0	0.35	2.50	3	1	0	0	0	10	16.5	0.69	0	
6/15/2004	0.5	0.50	1.50	2	1	0	0	0	6	15	0.63	0	
6/16/2004	6.0	3.30	5.00	14	0	0	1	0	1	33	1.38	0	
7/6/2004	8.5	1.10	4.00	14	0	0	1	0	20	33	1.38	0	
7/30/2004	8.5	2.70	4.00	11	0	0	1	0	24	28.5	1.19	0	
8/4/2004	2.0	0.65	2.00	4	1	0	0	0	5	18	0.75	0	
8/23/2004	1.5	0.45	2.00	6	0	1	0	0	19	21	0.88	0	
8/24/2004	3.3	0.50	1.50	4	1	0	0	0	1	18	0.75	0	
8/25/2004	2.5	1.25	2.50	7	0	1	0	0	1	22.5	0.94	0	
9/16/2004	4.0	0.70	2.50	89	0	0	0	1	21	145.5	6.06	0	
10/12/2004	3.5	0.40	1.75	4	1	0	0	0	27	18	0.75	0	
10/14/2004	16.0	0.65	6.00	3	1	0	0	0	2	16.5	0.69	0	
10/18/2004	16.0	1.25	7.50	20	0	0	1	0	4	42	1.75	0	
10/26/2004	3.3	0.60	2.00	5	1	0	0	0	8	19.5	0.81	0	
12/6/2004	12.0	1.75	5.00	24	0	0	0	1	41	48	2.00	0	
1/2/2005	13.0	2.00	6.50	13	0	0	1	0	27	31.5	1.31	0	
1/4/2005	24.0	2.65	16.00	30	0	0	0	1	2	57	2.38	1	22.00
1/5/2005	2.5	1.00	2.50	3	1	0	0	0	1	16.5	0.69	0	-79.00
1/12/2005	13.5	2.85	8.00	21	0	0	0	1	7	43.5	1.81	0	
2/7/2005	3.0	0.35	2.00	4	1	0	0	0	26	18	0.75	0	
2/13/2005	8.5	0.70	4.00	9	0	1	0	0	6	25.5	1.06	0	
3/22/2005	8.3	1.50	7.75	32	0	0	0	1	37	60	2.50	0	
6/8/2005	1.5	0.35	1.50	3	1	0	0	0	78	16.5	0.69	0	
6/13/2005	2.5	1.20	3.00	9	0	1	0	0	5	25.5	1.06	0	
6/25/2005	1.0	0.90	2.50	10	0	1	0	0	12	27	1.13	0	
7/11/2005	17.0	1.15	12.00	7	0	1	0	0	16	22.5	0.94	0	
15-Jul	2.0	1.00	2.00	10	0	1	0	0	4	27	1.13	0	
7/18/2005	1.5	0.60	2.00	9	0	1	0	0	3	25.5	1.06	0	
8/15/2005	12.0	2.25	8.00	50	0	0	0	1	28	87	3.63	0	
8/25/2005	1.5	1.00	2.00	9	0	1	0	0	10	25.5	1.06	1	1.00
8/26/2005	1.8	0.45	1.50	4	1	0	0	0	1	18	0.75	0	-35.00
8/29/2005	1.5	0.20	1.50	8	0	1	0	0	3	24	1.00	0	
9/14/2005	2.5	0.55	1.75	2	1	0	0	0	16	15	0.63	0	
9/15/2005	5.0	0.70	4.00	5	1	0	0	0	1	19.5	0.81	0	
9/19/2005	6.0	2.00	3.50	10	0	1	0	0	4	27	1.13	0	
9/25/2005	14.0	1.35	3.00	10	0	1	0	0	6	27	1.13	0	
9/28/2005	3.5	0.80	2.00	4	1	0	0	0	3	18	0.75	0	
10/20/2005	4.5	0.40	1.00	2	1	0	0	0	22	15	0.63	0	
10/31/2005	12.5	1.20	9.00	17	0	0	1	0	11	37.5	1.56	0	
11/14/2005	11.5	1.05	8.00	5	1	0	0	0	14	19.5	0.81	0	
11/27/2005	7.0	1.55	5.50	20	0	0	1	0	13	42	1.75	0	
1/10/2006	12.0	0.65	1.50	3	1	0	0	0	44	16.5	0.69	0	
1/28/2006	13.0	0.85	4.50	14	0	0	1	0	18	33	1.38	0	
2/16/2006	2.0	0.45	1.50	4	1	0	0	0	19	18	0.75	0	
3/8/2006	7.0	0.85	5.00	9	0	1	0	0	20	25.5	1.06	1	1.00
3/9/2006	7.0	0.40	2.50	5	1	0	0	0	1	19.5	0.81	0	-370.00
4/2/2006	1.5	0.80	1.50	4.5	1	0	0	0	24	18.75	0.78	0	
4/6/2006	6.5	0.40	3.00	6	0	1	0	0	4	21	0.88	0	
5/10/2006	14.0	0.75	2.50	5	1	0	0	0	34	19.5	0.81	0	
5/24/2006	1.5	0.50	2.00	4	1	0	0	0	14	18	0.75	0	
6/1/2006	3.0	1.30	2.00	6	0	1	0	0	8	21	0.88	0	
6/10/2006	4.5	1.05	2.25	4	1	0	0	0	9	18	0.75	0	
6/22/2006	3.5	0.50	1.00	1	1	0	0	0	12	13.5	0.56	0	
7/13/2006	4.0	1.20	4.00	20	0	0	1	0	21	42	1.75	0	
7/19/2006	1.0	0.85	16.00	5	1	0	0	0	6	19.5	0.81	0	
7/21/2006	0.8	0.60	1.00	7	0	1	0	0	2	22.5	0.94	0	
8/10/2006	5.5	1.15	4.00	14	0	0	1	0	20	33	1.38	0	
8/18/2006	2.0	0.75	2.50	9	0	1	0	0	8	25.5	1.06	0	
8/26/2006	2.5	0.45	2.50	6	0	1	0	0	8	21	0.88	0	
9/11/2006	4.5	0.50	2.50	3.5	1	0	0	0	16	17.25	0.72	0	
9/17/2006	8.0	1.35	3.00	18	0	0	1	0	6	39	1.63	0	
10/16/2006	14.0	2.10	8.00	32	0	0	0	1	29	60	2.50	0	
10/27/2006	9.5	0.90	3.50	3.5	1	0	0	0	11	17.25	0.72	0	
11/15/2006	15.0	1.25	5.50	13	0	0	1	0	19	31.5	1.31	0	
11/30/2006	32.0	3.45	9.00	13.5	0	0	1	0	15	32.25	1.34	0	
1/4/2007	8.5	0.45	3.00	3.5	1	0	0	0	35	17.25	0.7	0	
1/12/2007	21.0	1.75	12.00	12	0	0	1	0	8	30	1.3	0	
1/14/2007	11.0	0.80	2.00	2.5	1	0	0	0	2	15.75	0.7	0	
2/12/2007	8.5	0.80	2.50	1.83	1	0	0	0	29	14.745	0.6	0	
2/24/2007	8.5	1.25	6.00	15.5	0	0	1	0	12	35.25	1.5	0	
3/14/2007	7.0	0.60	2.50	1.4	1	0	0	0	18	14.1	0.6	0	
3/19/2007	0.5	0.40	1.50	0.8	1	0	0	0	5	13.2	0.6	0	
3/23/2007	3.0	0.30	1.25	0.42	1	0	0	0	4	12.63	0.5	0	
3/30/2007	8.5	0.70	4.25	1.5	1	0	0	0	7	14.25	0.6	0	
3/31/2007	6.0	0.75	2.50	0.73	1	0	0	0	1	13.095	0.5		
				Total	82	32	24	12					
				Percentage	54.7%	21.3%	16.0%	8.0%					

Indicates the presumed occurance of a CSO event occuring if this option were implemented

Indicates that the storage ponds would not be emptied before another wet weather event producing even more CSO volume needed to be stored in the ponds occurred

*Assumes WWTP is the limiting factor in returning flow stored in the ponds.

Avg. Days Btwn Events
13
Median - Days Btwn Events
10.000
Mode - Days Btwn Events
1

Major Assumptions:

Average time to return to average flow after ra	12 hr
Average capacity of plant to receive CSO Flow	16 mgd
	666667 gph

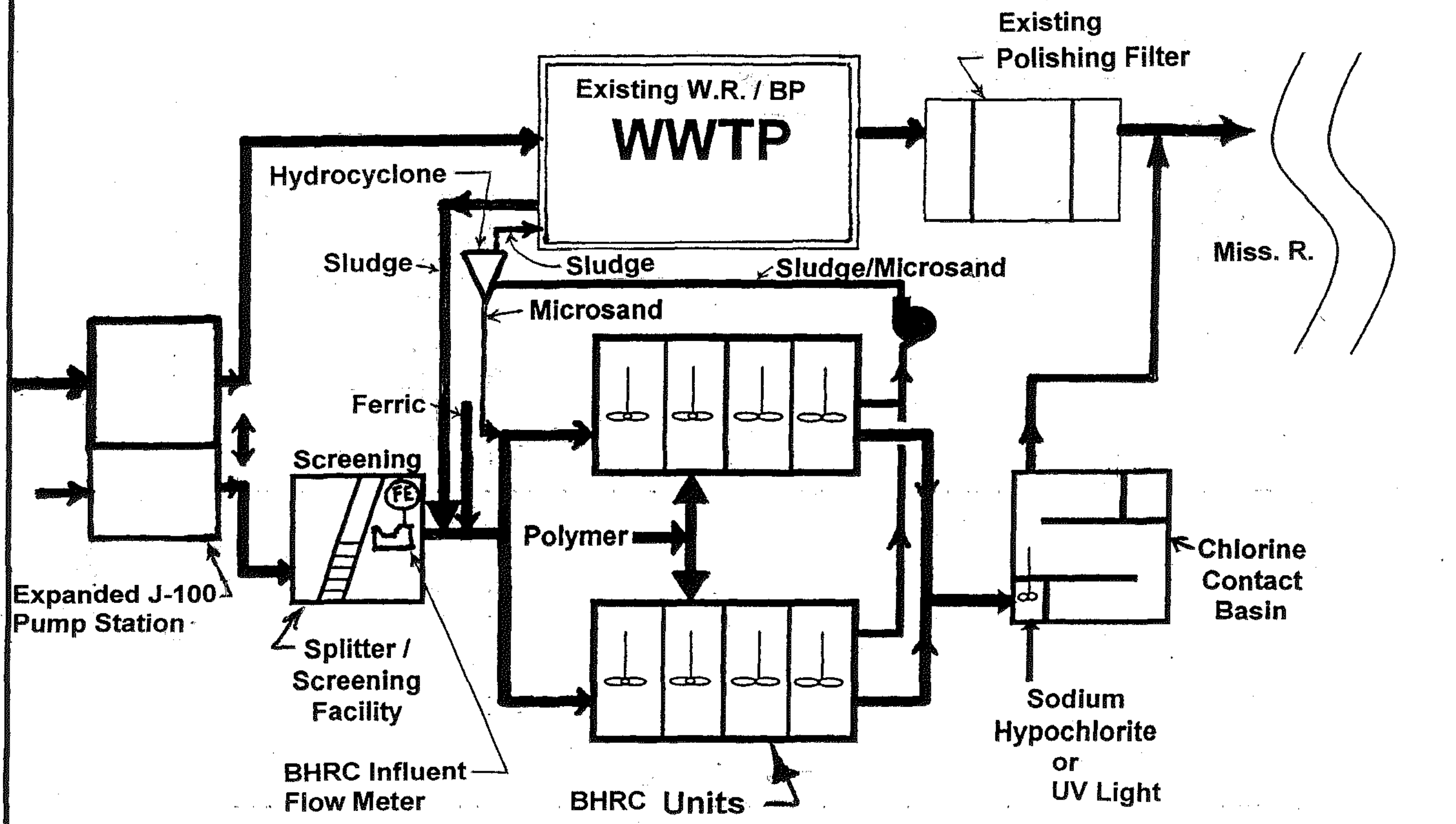


FIGURE 16 - PROPOSED WET WEATHER TREATMENT SYSTEM

May 2007

Using these Figures, construction cost estimates were prepared for the following:

1) implementing <u>only</u> **Option IV.A.** , which (even though implementing **Option IV.A.** alone is only questionably feasible, because of the projected 46 possible instances over a 4-year period when CSO discharges might occur) served as a "foundation" for all other feasible combinations of **Option VIII.A.** with **Option IV.A.**

2) implementing **Option IV.A.**, in combination with a concept for **Option VIII.A.** that involved installation of an 8 MGD-capacity BHRC wet weather treatment system.

Spreadsheets containing the gross breakdown of those construction cost estimates are presented in **<u>Appendix II</u>** to this LTCP. The estimated construction cost for implementing **Option IV.A.** alone is $1,650,000 (which, as previously indicated is really not a feasible CSO Control Option), and the estimated construction cost for implementing **Option IV.A. in combination with Option VIII.A.** is $2,635,000 plus $2,753,000. equals **$5,388,000** (based on assumed capacity for the BHRC wet weather treatment system of **Option VIII.A.** of 8 MGD).

For purposes of this LTCP, it has been assumed that the most logical method of calculating the benefit:cost ratio for CSO Control Options considered in this CSO LTCP's development is to divide the estimated quantity of combined wastewater flow that implementation of a given CSO Control Option would eliminate from the potential CSO discharge of the City of Wood River during the design-storm wet weather event (in Million Gallons, or MG) by the estimated dollar amount capital cost to implement that CSO Control Option.

On that basis, the combination **Option IV.A. with Option VIII.A.'s calculated benefit:cost ratio** would be (using the values presented above):

8 MG / $5.39 million = **1.48**

F. Recommendations

Based on the above-outlined, more-detailed evaluation of each of the previously-presented five CSO Control Options (or combinations of Options), along with the identified relative advantages and disadvantages of including each of the five Options in the Wood River CSO LTCP, and the relative benefit:cost ratio of each Option which was determined, the following represents the resulting recommendations as to whether each of the five CSO Control Options should be included in Wood River's CSO LTCP. Also discussed are preliminary recommendations regarding the order in which the recommended options should be implemented.

As previously stated, the suitability of **Option I.A.** for inclusion as part of this CSO LTCP was basically confirmed by the Stage 1 initial screening / ranking of CSO control alternatives and the Stage 2 preliminary evaluation of alternatives.

Based on its relatively low cost of implementation, as well as the opportunity which this project offers to accomplish some work, the tangible benefits of which should rather obviously be apparent to the residents of Wood River (which could help bolster public support for implementation of the remaining, higher-cost CSO control options that will need to follow), **it is strongly recommended that Option I.A. be included in the CSO LTCP for the City of Wood River <u>and</u> that Option I.A. be implemented first (i.e., before any of the other CSO Control Options recommended herein) by the City of Wood River**. It should be noted that this recommendation is being made, despite the fact that **Option I.A.** offers a relatively low benefit:cost ratio.

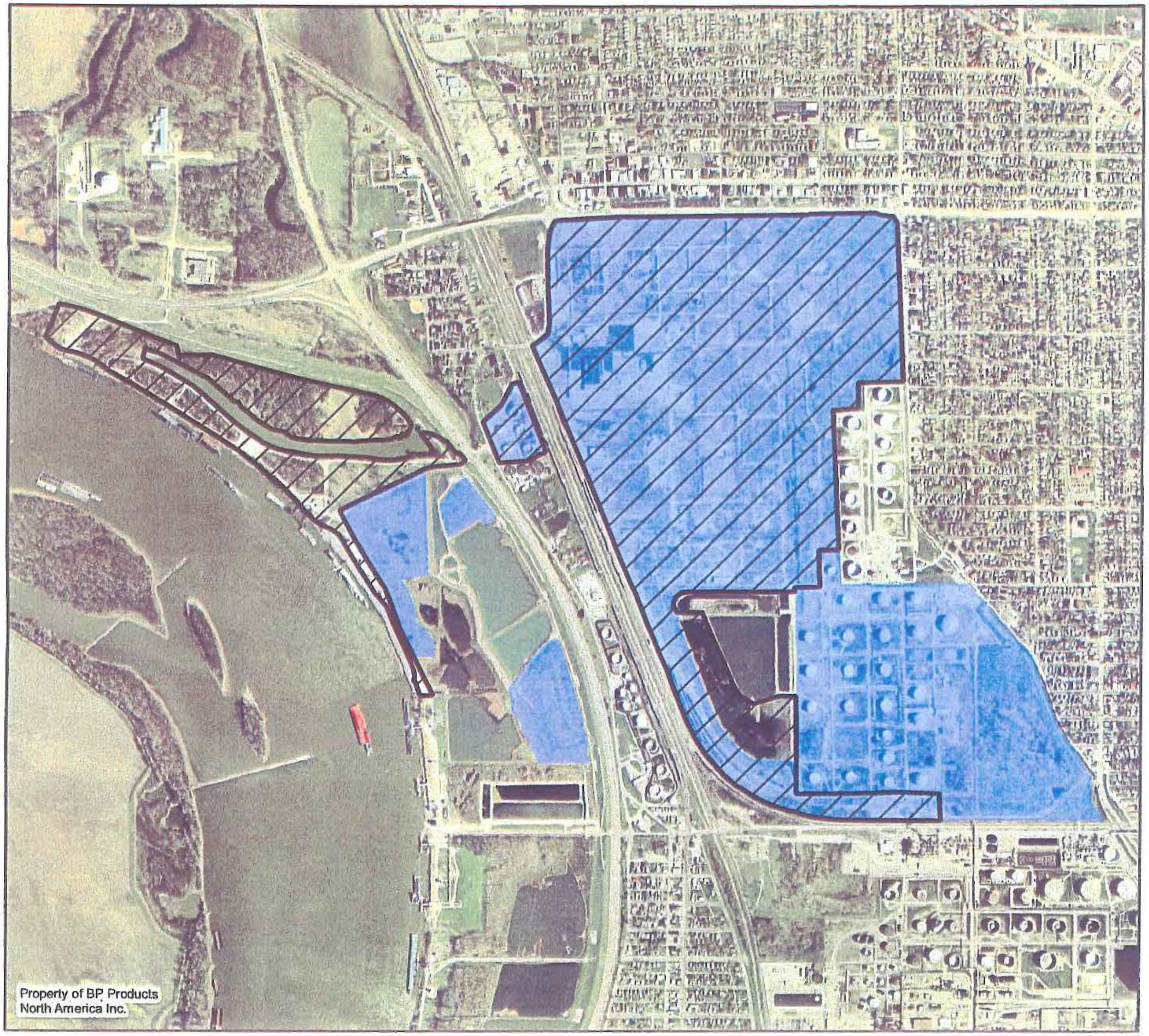
As has also been previously indicated, the suitability of **Option I.B.** for inclusion as part of this CSO LTCP was highly indicated by the Stage 1 initial screening / ranking of CSO control alternatives, and the Stage 2 preliminary evaluation of alternatives. Based on its relatively high benefit:cost ratio and the ability to produce similar (if not greater) potential positive public opinion as that offered by **Option I.A.**, **Option I.B.** would seem to justify a recommendation for inclusion in Wood River's CSO LTCP equally as strong as that given to **Option I.A.**.

However, **Option I.B.** has the distinct disadvantage that a **<u>significantly</u>** greater capital investment is needed to implement **Option I.B.**, than is needed to implement **any** other CSO Control Option being seriously considered for the Wood River CSO LTCP – approximately $13 million. A capital expenditure of this magnitude (even if it were implemented over a 5-year period) would represent a significant economic burden for the residents of the City of Wood River.

During the course of the preparation of this LTCP, it was learned that BP Amoco and the City of Wood River intend to "partner" in a project to redevelop a substantial parcel of property currently owned by BP Amoco which is located in the vicinity (and, in fact, extends "downstream") of the Central & Hawthorne potential project area. The proposed redevelopment area is indicated on **Figure 17**, on the following page.

When this BP Amoco property is redeveloped, the developing entity will be required to improve the sewer system in this area, to make it suitable to handle the substantial additional sanitary and stormwater flows produced by the new development.

It is, and quite obviously should be, the intent of the City of Wood River to require these new sewers to be constructed as separate sanitary and storm sewers – <u>not</u> combined sewers. The implication of this requirement for the redeveloped area is that the construction of a new storm sewer to serve the redevelopment area could readily be designed to also accommodate the "separated" stormwater from the proposed combined sewer system separation project for the Central & Hawthorne area.



N

850 425 0 850

Feet

1 inch equals 1,700 feet

Legend

Acreage to be Offered For Redevelopment (459.8 Acres)

Total Acreage of BP Facility in Which Drainage Enters Storage Ponds (569.6 Acres)

Notes:
Orthophotograph taken in April 2006.
- Source: Madison County GIS Department.

FIGURE 17

URS 100 South Wacker Drive Suite 500
Chicago, Illinois 60606

City of Wood River
CSO Information
BP Former Refinery
Wood River, Illinois

DESIGN: GV	CHKD: -	PROJECT NO.	FIG NO.
DRAWN: MDC	DATE: 4/20/07	25366338	--

O:_PROJECTS_(APR-MXD)_A-F\BP\WOOD_RIVER\.MXD

With the redevelopment area developer and the City sharing in the cost of such a sewer, the "net" cost-effectiveness of CSO Control **Option I.B.** could conceivably be shifted back into favorable consideration for inclusion into the CSO LTCP for the City of Wood River.

Given all of the above factors and considerations, **it is strongly recommended that Option I.B. be only tentatively included in the CSO LTCP for the City of Wood River; and that Option I.B. be implemented only if the City of Wood River can develop a partnering arrangement with the entity redeveloping the nearby property (currently owned by BP Amoco), wherein that entity provides at least one-half of the total cost of implementing Option I.B., as part of that partnership arrangement.**

Insofar as **Option IV.A.** is concerned, it is quite likely that in addition to the $1.6 million cost of implementing this option (presented in **Appendix II**), **the use of the Levee District Pump Station will be necessary to divert the peak CSO flow rates from the City of Wood River to the BP Amoco Storage Ponds**. It is assumed that the Levee District would be willing to come to an agreement with the City on the use of this pump station for this purpose, however the costs involved are not know at this time. It is expected that the addition of two 84" sluice gates, a diversion structure, and 200 feet of 84" sewer to direct flow from the 84" outfall sewer to the storage ponds would add and additional $ 400,000 to the cost of this project for a total implementation cost of approximately $ 2 million.

It should be re-emphasized that **implementation of this Option is really only sensible as part of a combination CSO Control Option** with **Option VIII.A.** Implementation of this Option with the intention of also implemnting Option VIII.A., including the added cost of $400,00 for modifications to allow the Levee District Pump Station to pump Wood River CSO flows into the BP Amoco storage ponds, is assumed to be approximately $3 million. **However, BEFORE Option IV.A. is recommended to be a part of the City's FINAL LTCP, more analysis is necessary**.

With respect to **Option VII.B.**, in combination with **Option VII.A.**, as previously stated in this Section VIII. of the LTCP, it was determined that this combination CSO Control Option was NOT feasible, for both technical and economic reasons.

It is presumed that the early implementation of Option I.A. and Option IV.A. will very likely be quite effective in reducing the "excess" quantity of combined wastewater which must be discharged by the City of Wood River (because the City's capacity to treat, and/or to temporarily-store-and-then-treat, combined wastewater is less than the quantity of combined wastewater conveyed from the City's combined sewer system to the City's treatment / storage facilities), such that actual CSO discharges by the City of Wood River **will** be reduced to an average of less than four events per year.

Finally, considering all of the factors and considerations surrounding **Option VIII.A.**, it is assumed that this be option would be a "last resort" plan if other improvements recommended did not allow the City of Wood River to reach the necessary level of

CSO control. This alternative would not only be useful in returning flow to the treatment plant at a faster rate, reducing the potential of CSO overflows due to insufficient capacity in the storage ponds, but may also be designed to be utilized to some extent during the month long shut down of the secondary treatment train. This, in affect, would reduce the volume of WWTP primary effluent discharged into the storage ponds during shut down, possibly allowing enough extra capacity in the storage ponds to continue to divert CSO flows to these ponds during the annual month-long shut down.

It is conceivable that the 8 mgd treatment capacity of this proposed “supplemental” treatment unit may be reduced to some lower capacity after CSO flows have been accurately measured and the other recommendations of this LTCP have been implemented. Reduction in the capacity of this “supplemental” treatment would also reduce the implementation costs of this option. However, for purposes of the financial analysis (detailed in the next section) it is expected that this option will cost approximately $2.75 million. **However, BEFORE this option is recommended to be a part of the City’s FINAL LTCP, more analysis is necessary.**

At the present time, the recommendation of implementing Option I.A. is the only CSO control option being recommended. More analysis of Option IV.A. and Option VIII.A. is necessary to achieve a reasonable level of control/cost that the City can feasibly implement.

END OF SECTION VIII.

IX. CITY'S FINANCIAL CAPABILITIES TO IMPLEMENT CSO CONTROLS

Financial issues need to be considered side-by-side with environmental issues, in determining both the proper CSO control mechanisms to be included in a CSO Long Term Control Plan for a community, and the implementation schedule for the selected CSO control mechanisms. CSO policy recognizes the financial burden that may be placed upon a community; and states that an implementation schedule "may be phased based on the relative importance of adverse impacts upon WQS and designated uses, priority projects identified in the long-term plan, and on a permittee's financial capability."

There are several indicators of financial capability which are routinely used for evaluating the "financial capability" (available resources) of a community. Such a financial analysis typically involves a two-step approach which not only identifies the impact of wastewater and CSO controls costs on individual households; but also examines the debt, socioeconomic, and financial condition of the community.

The first phase result is termed the Residential Indicator, while the second phase results are termed the Permittee's Financial Capability Indicators (comprising a total of six separate indicators). Using these Indicators, then, a Financial Capability Matrix can be prepared which represents an overall assessment of the Permitee's financial capabilities.

In addition to these indicators, other factors which serve to define the current financial burdens on the residents and the City should also be considered, when developing a schedule for CSO control implementation scheduling.

A. Step 1: Residential Indicator Determination

The Residential Indicator measures the financial impact of the costs of implementing current and proposed wastewater treatment and CSO controls on a per household basis. This requires the determination of the Cost Per Household (CPH) for current and proposed wastewater and CSO controls, and the Median Household Income (MHI) of residences in the community.

Since, in this situation, the costs of increased controls for CSO flows would be shared among the residents of the City of Wood River, Village of South Roxana, and the Village of Hartford, a weighted MHI was used and applied to the total number of households within the Wood River Wastewater Treatment Plant service area (i.e., both Villages and the City itself).

The resulting value of the CPH and MHI was found to be \$263.79 and \$42,819, respectively. This results in a Residential Indicator of 0.63%, which falls in the **low burden** ranking category. It is important to note that an estimation of O&M costs were not included in this analysis due to unknown variables which could significantly effect the estimate. However, even if O&M costs were considered to reach as high as \$500,000 per year, the Residential Indicator would still be below 1%, and would still fall in the low burden ranking category. The detailed calculations involved in determining the CPH, MHI, and resulting Residential Indicator are shown in **<u>Appendix CC</u>**, along with references for all figures reported.

B. Step 2: Permittee's Financial Capability Indicators Determination

The Permittee's Financial Capability Indicators measure the debt burden, socioeconomic conditions, and financial operations of a community. Calculating these Indicators requires the determination of: (1) bond rating, (2) overall net debt as a percentage of full market property value, (3) unemployment rate, (4) median household income, (5) property tax revenues as a percent of full market property value, and (6) property tax revenue collection rate for the Permittee. The calculated values for each of these six indicators, along with the references for all figures reported, can be found in **Appendix CC** of this LTCP.

The most recent (2003) bond rating in 2003 by Standard and Poor's rating agency for the City of Wood River was reported to be AAA -- a "strong" classification. The City's overall net debt as a percentage of full market value was determined to be 1.45%, which also falls within the "strong" rating category (below 2%) . The unemployment rate in the month of June 2006 for the City of Wood River was 5.5%, while the national average was 4.6%. This shows the unemployment rate in the City of Wood River to be 0.9% higher than the national average, falling within the "mid-range" rating category (±1% of the national average).

The median household income was found to be 19.5% below the national average of $53,195, falling within the "mid-range" rating category (± 25% of the national MHI). Property tax revenue as a percentage of full market property value for the City of Wood River was found to be 0.57%, again falling within the "strong" rating category (below 2%). The City's property tax revenue collection rate was found to be approximately 99%, falling within the "strong" rating category (above 98%).

Using a point system which assigns 1 point for a "weak" rating, 2 points for a "mid-range" rating, and 3 points for a "strong" rating, for each of these six indicators, the average of the scores of the six indicators (i.e. the Permittee Financial Capability Indicator) was found to be 2.7, which is classified as **strong**.

C. Financial Capability Matrix Preparation

By inputting the calculated Residential Indicator Ranking and the Permittee Financial Capability Indicators Ranking into the Financial Capability Matrix, the relative level of financial burden placed upon the City and its residents as a result of the costs associated with implementing a particular CSO Long Term Control Plan can be determined. The Financial Capability Matrix can be seen below, and the level of burden for the City of Wood River using the Residential Indicator Rating and the Permittee Financial Capability Indicators Ranking developed in the previous sections reveals that the CSO controls chosen for implementation will be a **low burden** on the citizens of the City of Wood River.

FINANCIAL CAPABILITY MATRIX FOR THE CITY OF WOOD RIVER, IL

Permittee Financial Capability Indicators Rating	Residential Indicator Ranking		
	Low (Below 1.0%)	Medium (Between 1% and 2%)	High (Above 2%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

D. Other Financial Considerations

Additional factors concerning the community's financial situation need to be addressed in order to adequately evaluate its capability to finance the CSO controls proposed in this LTCP. The first of these factors is related to Item (5) - property tax revenue as a percent of full market property value - which is used in determining the Permittee Financial Capability.

Although the City of Wood River collects a property tax revenue of only 0.58% of the full market property value, property owners pay additional property taxes which go toward funding other entities such as the St. Louis Regional Airport, Lewis & Clark College, the City of Wood River Library, Wood River Hospital, Madison County, East Alton-Wood River High School, Wood River Road and Bridge fund, East Alton School District, and Hartford-Wood River School District.

In fact, four separate tax codes (rates) were imposed in the City of Wood River in 2004, as listed below:

Tax Code 157	8.74%
Tax Code 158	10.81%
Tax Code 166	10.07%
Tax Code 479	10.07%

It is important to note that these percentage rates are based on assessed property value and not full market property value (and thus, can not be directly compared with the reported value of 0.58%). The portion of the property tax revenue which the City of Wood River is entitled only accounts for 1.47% of the total property taxes collected.

Assuming that the average property tax rate is the same as the average of the four tax codes presented above (9.92%), the overall property taxes collected from the residents of the City of Wood River as a percentage of full market property value would be 3.3%. This adjusted value of 3.3% falls within the "mid-range" rating, carrying a capability point value of 2. Re-evaluation of the resulting Permittee Financial Capability Indicators Rating produces a value of 2.5, which alters the rating to "mid-range".

It is important to note, however, that the actual amount of property taxes collected as a percent of full market value is not only a function of these various tax codes imposed on the residents, but also of the overall area that each of these codes are levied in, as well as the distribution of the population and the assessed value of the property contained within these areas. The upper limit of the amount of property taxes collected as a percent of full market value most likely is imposed on those residents within the area subject to Tax Code 158. This percentage of property taxes collected as a percent of full market property value would be approximately 3.6%. Although this 3.6% value does not further alter the rating, it is approaching the upper limit of this rating category's range (4%).

Another factor which has had great impact on the City of Wood River's financial ability to fund its wastewater treatment operations is the operating agreement with BP Amoco through which the City treats wastewater from BP Amoco's facilities. This agreement, originally adopted in 1982, gifted the Amoco treatment units to the City of Wood River to improve the wastewater treatment plant capacity, to make it able to handle the City's domestic wastewater flows, as well as Amoco's wastewater. The contract between BP Amoco and the City of Wood River ensures that BP Amoco retains the sole usage rights to 2.6 MGD of the wastewater treatment plant capacity (or 949 MG per year) through the condition that BP Amoco pays for the entire 2.6 MGD capacity whether it is utilized by BP Amoco or not.

Through this contract, the City is guaranteed constant revenue from BP Amoco to pay for wastewater treatment operating and maintenance expenses, and this is reportedly the main reason why sewer rates have not been raised in recent years. However, the renewal of this contract was recently negotiated; and, on the request of BP Amoco, was only extended for a three year period (the shortest time frame for which the original agreement stated that the contract could be renewed, after the initial 20 year term expired). Therefore, it is uncertain as to whether this source of revenue for the City of Wood River will continue to be available after this current three-year contract expires, as BP Amoco may be interested in renegotiations.

E. Capital Funding Options

The basic options available to municipalities and other public sector entities for funding infrastructure capital improvements include: bonds, grants, loans, public / private partnerships (i.e., privatization), and others (e.g., "pay-as-you-go").
The potential usefulness of each of these options for application by the City of Wood River to the funding of the capital improvements recommended by this CSO LTCP is discussed in the text that follows.

Bonds

Bonds are promissory notes issued (sold) by governments (state and local) and quasi-governmental entities (e.g., public school districts) to raise funds for projects to construct long-term facilities, of all types (government centers, firehouses, bridges, etc.) which require a relatively large amount of capital investment. Such bonds have fixed, long-term payment schedules (often 20 years or more) over which the bond-holders are repaid by the entity that issued the bonds.

In the public sector, bonds are further sub-divided into two types – related to how the bond-issuing entity chooses to generate the money needed to repay the bond holders. **Revenue bonds** are generally "backed" by service charges or fees paid by the users of the facility which the bonds were used to construct. **General Obligation** (GO) bonds are, in contrast, "backed" by taxes levied by the bond-issuing entity to all those who live in the taxing district (or city limits) of the bond-issuing entity – not just the users of the facility.

While GO bonds are viewed as the more secure means of repayment by potential purchasers of local government bonds (mainly because user fees cannot be counted on to generate sufficient revenue to repay the bond holders), most local governments now can only issue GO bonds following a favorable vote by the residents of their taxing district – which is very often a difficult proposition. However, many local governments now also require voter approval of increases in user fees. Nevertheless, revenue bonds are considered by most of the public to be a fairer means of "servicing" the debt for capital improvements; because only the users of the indebted facility will be faced with repaying that debt; rather than all residents within a taxing district who may or may not use the indebted facility.

Grants

Many municipalities have prior experience with grants (i.e., matching funds awarded to those municipalities by the federal or state governments, usually based on need and the severity of a grantee's problems) which they received during the 1970's and early 1980's for the construction of wastewater treatment facilities or other infrastructure projects. At one point, the federal government was providing 90 percent of a project's cost to a municipality as a grant, provided that the municipality could provide the remaining 10 percent). Over time, however, the federal "share" was reduced, as lesser and lesser amounts of potential grant money was appropriated by Congress; until, in the mid-1980's, the federal grant program was eliminated entirely.

A relatively limited amount of grant funding is still available – primarily to economically-disadvantaged communities – through some state governments and/or quasi-governmental agencies (such as the Community Block Grant Development program, Rural Development Administration, the Economic Development Administration, and others). Essentially, however, the **direct federal grant program** was replaced by the State Revolving Fund (SRF) subsidized, low-interest loan program for funding of wastewater and drinking water improvements. This SRF program's "seed money" is furnished by the federal government to the states, and the states actually administer their own individual SRF loan program, with oversight provided by the USEPA.

<u>Loans</u>

While the above-described SRF (State Revolving Fund) loan program is presently <u>the</u> most widely-used type of loan for funding wastewater and drinking water capital improvement projects, there are certainly other types of loans available to public sector borrowers – private bank loans, non-SRF state-subsidized loans, and others.

Obviously, the major difference between these loan programs is the interest rate charged to the borrower by the lender. By far, even in times such as these when credit is readily available from private lenders at very reasonable terms, the lowest interest rate form of loan available is the low-interest SRF loan. Typically, the SRF interest rates are tied to the prime interest rate in effect at any given time; but, because of the state / federal subsidies and the "backing" of the loan by the credit-worthiness of the municipality and the state, the SRF interest rate is typically "adjusted" to be anywhere from 4 to 5 points below that prime interest rate – meaning an effective loan interest rate to the borrowing municipality of between 1.5 and 2.0 %, typically. Also, because of the revolving nature of the loan program (wherein future loans are constantly being re-capitalized by the repayment of principal and interest from prior loan recipients), the amount of money available to states to loan out to municipalities remains relatively large, from year-to-year.

Certainly, the SRF loans have <u>significant</u> "conditions" attached to them (procurement requirements, strict required accounting practices, equal opportunity employment, prior approval of construction plans, and so on), much like the former direct federal grants program had; however, SRF loans remain a VERY attractive method of financing for municipal wastewater and drinking water capital improvement projects.

<u>Privatization</u>

This is a relatively new financing concept within the wastewater and drinking water fields, wherein public and private entities effectively form a "partnership" through which wastewater or drinking water facilities (or even other municipal infrastructure improvements, such as prisons, libraries, etc.) can be designed, constructed, and operated.

The most common form of such privatization partnership in the wastewater / water industry involves the private entity agreeing to some combination of arrangement(s) to design, construct, own, <u>and</u> operate a given facility needed by a municipality in exchange for the right to lease that facility back to the municipality (for an annual fixed fee or volume-related user charge) for the purpose of meeting its wastewater treatment / disposal or drinking water treatment / distribution obligation to the municipalities residents.

There can be certain legal complexities to the formation of such public / private partnerships, and the municipality must be willing to cede nearly all of the control of the design / construction / operation process to the private partner (which can be very difficult for those communities that have always controlled these functions themselves, in the past).

However, for municipalities which find themselves with no other realistic means for financing wastewater, drinking water, or other infrastructure systems that they desperately need (or, which are being mandated by regulatory authorities), privatization may provide the only realistic financing option. Privatization has also become a much more commonly-used financing method for municipalities over the past 15 years, as the federal tax treatment of such "deals" made privatization a very attractive investment for the private sector.

Other Options

Chief among the other capital project funding options (such as special assessments, sales tax increases, etc.) available to public sector entities is a concept referred to as "pay-as-you-go". With this approach, the municipality typically institutes a significant increase in the user fees (service charges) which are already in place to offset the costs to the municipality for ownership / operation / maintenance of their existing wastewater collection / treatment or drinking water treatment / distribution facilities, based on each resident's actual usage of those facilities.

The amount of that increase in user fees is specifically calculated to match the additional cash flow which that municipality will need in order to pay a consultant to design, a contractor to construct, and the municipality to operate / maintain whatever additional (or replacement) facilities are required. Ideally, this user fee (rate) increase should be instituted at least 6 months (and possibly one or even two years) **prior** to the time when the anticipated additional cash needs to begin "flowing", so that the municipality will have time to bring in that additional rate payer revenue. The other very important reason for implementing a "pay-as-you-go" rate increase well in advance of the actual need for the new facility expenditures is so that the rate increase can be quickly adjusted (after being instituted) to account for residents' water conservation measures to reduce their total user fee paid, which will typically be implemented by some residents in the face of such a significant increase in rates. When this occurs, the rate increase may well have to be increased even slightly more, in order to make sure that the actual use of the facilities does, in fact, generate the total amount of needed additional revenue.

F. Financial Summary and Conclusions

The assumed cost of implementing this CSO LTCP of nearly $8 million will be a significant expense to the City of Wood River. The financial analysis presented in the sections above reveal that, by USEPA definition, however, this amount of capital expenditure for the City should result in a "low burden". This is mainly due to the fact that there is currently no reported annual debt services associated with the current WWTP operations. This situation is assumed to have developed from the steady payments received from BP Amoco for the treatment of the facilities wastewater, irrespective of the amount of flow which is actually treated.

Even though the USEPA-defined financial analysis results in a "low burden", the analysis revealed that the **City's current sewer rates will need to increase by nearly 65%, or $100 a year, to an average sewer bill of $22/month.**

G. Data Period Analyzed

Due to lack of rainfall events of sufficient intensity / duration to produce combined sewer overflow (CSO) discharges from the City of Wood River's sewer system, the effort to complete this CSO Long Term Control Plan (LTCP) had to be extended by several months beyond the originally-anticipated completion date of November 2006. As a result, data / information was originally gathered and analyzed for this LTCP during the first few months of 2006, generally covering the period from January 2002 to December 2005 (where such a span of historical information was available for a given parameter).

The effort to prepare this LTCP was ultimately delayed, by the lack of CSO-producing wet weather events, to the point where data for the entire calendar year 2006 did become available, for many of the parameters evaluated. However, it was determined by City staff and Horner & Shifrin personnel that the possible benefits to be gained from an effort to gather and analyze this additional data for 2006 (in order to "refine" the analysis / conclusions obtained through review of the years 2002 through 2005 data) was far outweighed by the cost involved in that effort.

For that reason, even though this LTCP was not completed until mid-2007, no data from year 2006 has been included herein or analyzed. Moreover, H & S personnel do not believe that further analysis of 2006 data would have revealed any differences from the analysis of the years 2002 though 2005 data which would be significant enough to alter the conclusions reached in this LTCP from the review / analysis of the 2002 through 2005 data.

END OF SECTION IX.

X. POST-IMPLEMENTATION COMPLIANCE MONITORING PROGRAM

Obviously, a key element of any community's CSO Long Term Control Plan must be a thorough, accurate program for monitoring their combined sewer system – following the implementation of the improvements to that system recommended by the LTCP – in order to assure all concerned parties that the actual operations of the improved system are in compliance / conformance with all regulatory requirements, and to provide the community with documentation of that compliance.

A. General Considerations

Federal CSO Control Policy will dictate much of the "contents" of an appropriate compliance monitoring program which should be put into place by the City of Wood River, in order to achieve the above-outlined objectives – in terms of the types of parameters to be monitored, and the frequency of monitoring. That Policy states that the compliance monitoring program is intended to ".... verify compliance with water quality standards and protection of designated uses in the stream receiving the CSO discharges, as well as to ascertain the effectiveness of the CSO controls implemented."

It should also be noted that the Federal CSO Control Policy provides that "... if adequately supported by data and analyses from a compliance monitoring program or other such programs, USEPA guidelines and/or regulations provide state regulatory agencies with the flexibility to adapt their Water Quality Standards and implementation procedures to reflect site-specific conditions (including those related to CSO's) which can not effectively be controlled ... In addition, the regulations ... specify when and how designated uses of streams may be modified." Thus, a properly managed compliance monitoring program could (under certain circumstances) provide the means whereby a non-complying community could petition the state regulatory agency to modify the constraints imposed on their CSO discharges by Water Quality Standards and/or the designated use(s) of the stream receiving those CSO discharges.

The NPDES Permit issued by IEPA, regulating the effluent discharge limitations for the wastewater treatment plan (and related CSO discharges), will also establish certain required elements of this compliance monitoring program.

The overall, true effectiveness of any plan can usually be determined more readily than can the effectiveness of individual components of that plan. This means that the LTCP compliance monitoring program should be designed to both measure effectiveness and to provide accountability.

The compliance monitoring program elements (such as a map showing monitoring locations, a spreadsheet for recording the frequency of data being obtained from those locations, a list of parameters to be monitored, the recorded values of those parameters for each monitoring event, and a plan for QA/QC of the data obtained from conducting the monitoring) should be identified in a form similar to the sampling plan developed for obtaining the data needed to prepare this LTCP.

B. Proposed Compliance Monitoring Program Specifics

It is recommended that the City of Wood River conduct the basic elements of the compliance monitoring program presented in this LTCP both during and after implementation of the improvements to that system recommended by the LTCP. The monitoring performed during implementation will serve to provide a "baseline", for later use in comparing the results obtained from conducting the monitoring program after implementation in order to assess the actual numerical benefits to and improvements in the aquatic environment which have resulted from implementation of the improvements to that system recommended by the LTCP.

In addition, the bi-annual evaluation of the City's continuing compliance with the Nine Minimum Controls (as described in Section VII. of this LTCP) should also be conducted in conjunction with the City's other compliance monitoring program activities.

END OF SECTION X.

XI. PROPOSED SCHEDULE FOR IMPLEMENTING THIS CSO LTCP

USEPA's published guidance documents for use by permittee's in developing CSO Long Term Control Plans clearly acknowledge that financial issues need to be considered, side-by-side with environmental issues, in determining both the proper CSO control mechanisms to be included in a CSO Long Term Control Plan for a community, and the implementation schedule for the selected CSO control mechanisms.

A. General Considerations

Federal CSO policy recognizes the financial burden that may be placed upon a community in the course of controlling CSO's; and states that an implementation schedule "… may be phased based on the relative importance of adverse impacts upon WQS and designated uses, priority projects identified in the long-term plan, and on a permittee's financial capability."

Section IX of this LTCP document defines the financial capability of the City of Wood River, with respect to the City's regulatory requirement to control the single point of CSO discharge which periodically emanates from the City's combined sewer system.

Given the significant expenditure of capital cost which the City of Wood River will have to commit (in order to implement the CSO control alternative(s) recommended in the LTCP which will ultimately be approved by USEPA) relative to the above-defined financial capability of the City of Wood River, it was readily evident that an implementation schedule based on spreading the performance (and cost) of implementation over a several-year period was needed. In fact, federal CSO Control Policy recommends that significant consideration should be given to the community's financial capability when developing a CSO LTCP implementation schedule.

The federal CSO Control Policy also recommends that a phased implementation schedule for CSO LTCP's consider the relative importance of adverse impacts on water quality standards and designated uses of the stream(s) receiving CSO discharges. In particular, those elements of the CSO LTCP which are designed to reduce / eliminate CSO's discharging to sensitive areas and/or which cause use impairment should be performed as early as possible in the phased implementation schedule.

Of course, in Wood River's case, there is only one point of discharge (outfall) and all of the recommended CSO control options are designed to reduce / eliminate CSO's discharging to sensitive areas and/or which cause use impairment. For this reason, the phasing of the implementation schedule for Wood River's CSO LTCP will be based almost exclusively on financial capability considerations and the technical relationship (proper sequencing) of related components.

Obviously, implicit in the development of any phased implementation schedule is the need to set priorities. For example, if funding is the most significant issue, the least expensive control option to implement might well be assigned the highest priority and be scheduled earliest in the overall implementation schedule. On the other hand, if developing public support for the CSO LTCP plan is considered critical (so that the municipality's residents will favorably view the necessary rate increase), then those control options which would be expected to produce visible, positive water quality impacts might well be the options to implement first.

B. Proposed Phased Implementation Schedule

Also, given the fact that City's NPDES permit for the WWTP, which normally treats the combined sewage flows from the City of Wood River (but which experiences overflows during wet weather periods when the combined sewage flow to the WWTP exceeds the WWTP's treatment / hydraulic capacity), is currently in the process of renewal – as well as the fact that NPDES permits typically have a "term" of 5 years – it was also clearly evident that phased implementation schedule for this LTCP should not have a total duration exceeding 5 years. Otherwise, the City could find itself in a non-compliance situation when its WWTP's "new" NPDES permit was issued in 2012.

For these reasons, then, the Gannt-chart presented on the following page represents the 5-year-total-duration, phased implementation schedule which was developed for the City of Wood River to accomplish in fulfillment of the recommendations of this CSO Long Term Control Plan.

END OF SECTION XI.

CITY OF WOOD RIVER, ILLINOIS

IMPLEMENTATION OF LONG-TERM C.S.O. CONTROL PLAN

ID	TASK DESCRIPTION
[illegible]	Obtain Final Approval of Long-Term CSO Control Plan From USEPA
2	C.S.O. CONTROL OPTION I.A
3	Obtain Needed Add'l Data on Project's Field Conditions (Geotech., Survey, etc.)
4	Develop Prelim. Design of Physical Improvements - OPTION I.A.
5	Submit Prelim. Design Documents to City & USEPA Staff for Review
6	Obtain Review Comments on Prelim. Design Documents
7	Perform Final Design / Prepare Constr. Docs. (Plans & Specs.) for Improvements
8	Assist City to Develop Plan for Operations During Construction of Improvements
9	Submit Final Design & Constr. Documents to City & USEPA Staff for Review
10	Obtain Review Comments on Final Design & Construction Documents
11	Incorp. Review Comments / Finalize Constr. Docs. for Improvements
12	Assist City in Obtaining Contractor Bids for Construction of Improvements
13	Assist City in Awarding Construction Contract to Selected Bidder
14	Assist City in Monitoring Constr'n of OPTION I.A. Improvements by Contractor
15	Assist City in Placing Improved Facilities into Operation
16	C.S.O. CONTROL OPTION IV.A.
17	Obtain Needed Add'l Data on Project's Field Conditions (Geotech., Survey, etc.)
18	Develop Prelim. Design of Physical Improvements - OPTION IV.A.
19	Submit Prelim. Design Documents to City & USEPA Staff for Review
20	Obtain Review Comments on Prelim. Design Documents
21	Perform Final Design / Prepare Constr. Docs. (Plans & Specs.) for Improvements
[illegible]	Assist City to Develop Plan for Operations During Construction of Improvements
23	Submit Final Design & Constr. Documents to City & USEPA Staff for Review
24	Obtain Review Comments on Final Design & Construction Documents
25	Incorp. Review Comments / Finalize Constr. Docs. for Improvements
26	Assist City in Obtaining Contractor Bids for Construction of Improvements
27	Assist City in Awarding Construction Contract to Selected Bidder
28	Assist City in Monitoring Constr'n of OPTION IV.A. Improvements by Contractor
29	Assist City in Placing Improved Facilities into Operation
30	RECOMMENDED C.S.O. CONTROL OPTION VIII.A.
31	Obtain Needed Add'l Data on Project's Field Conditions (Geotech., Survey, etc.)
32	Develop Prelim. Design of Physical Improvements - OPTION VIII.A.
33	Submit Prelim. Design Documents to City & USEPA Staff for Review
34	Obtain Review Comments on Prelim. Design Documents
35	Perform Final Design / Prepare Constr. Docs. (Plans & Specs.) for Improvements
36	Assist City to Develop Plan for Operations During Construction of Improvements
37	Submit Final Design & Constr. Documents to City & USEPA Staff for Review
38	Obtain Review Comments on Final Design & Construction Documents
39	Incorp. Review Comments / Finalize Constr. Docs. for Improvements
40	Assist City in Obtaining Contractor Bids for Construction of Improvements
41	Assist City in Awarding Construction Contract to Selected Bidder
42	Assist City in Monitoring Constr'n of OPTION VIII.A. Improvements by Contractor
[illegible]	Assist City in Placing Improved Facilities into Operation

H & S, Inc.
05/02/07

Task | Milestone | Summary | Critical Task

PROPOSED PHASED L.T.C.P. IMPLEMENTATION SCHEDULE